

# Assessment of Water Quality Index for the potable water in Dahanu Taluka, Maharashtra State, India

Miss.Pooja Jha, Assistant Proffesor ,N.B.Mehta science college, Bordi.

## Abstract

The present work is aimed at assessing the quality of the potable water of Bordi area, of Dahanu taluka. This has been determined by collecting potable water samples from five different schools and colleges and subjecting the samples to a comprehensive physicochemical and microbial analysis. The following 12 parameters have been considered: pH, total hardness, calcium, chloride, acidity, alkalinity, total dissolved solids, total suspended solids, total solids and temperature, dissolved oxygen. The analysis reveals that the groundwater of the area needs some degree of treatment before consumption. The bacterial isolates were *Escherichia coli*, *Pseudomonas aeroginosa*, *Klebsiella sp.*, *Staphylococcus aureus*. We can use this study for the assessment of the hygienic problems of the water.

## Introduction

There are 75% water is present in the world but the source of potable water is only 3%. Therefore it is necessary that we should conserve and does not contaminate the potable water. Bordi is situated in palghar district ,dahanu taluka, Maharashtra. Many schools ,colleges, are situated in bordi area. The total population of bordi area is only about 4000 but more than 10000 students are travel in bordi , from virar (Mumbai) to vapi (Gujarat) for their studies. So it is necessary that source of potable water for students as well as local people should be free from harmful chemicals and bacterial pathogen.

For this study ,the 4 water samples were collected from schools and colleges and 2 water samples were collected from bordi villages.

Accurate and timely information on the quality of water is necessary to shape a sound public policy and to implement the water quality improvement programmes efficiently. One of the most effective ways to communicate information on water quality trends is with indices. Water quality index (WQI) is commonly used for the detection and evaluation of water pollution.

## Materials and Methods:

Sample Collection: Potable water samples collected from four different schools and colleges which are located in bordi area. Two water samples collected from bordi villages.

Method of analysis:

Physicochemical parameter: temperature ,pH, dissolved oxygen, total dissolved solids, total suspended solids, acidity, alkalinity, carbonates, etc.

Microbiological analysis: Standard plate count for total bacterial count, routine analysis of potable water for determination of coliform bacteria.

Results and discussion:

### 1 Physicochemical analysis:

The purpose of the study was to find out the concentration of major ions and other physicochemical parameters of the different water samples collected from college canteen, N.B. Mehta College, National Jr. College, S.P.H. high school which is present in bordia area.

Following results were observed.

| Parameter        | Result Analysis   |                      |                 |                    | Standard values |
|------------------|-------------------|----------------------|-----------------|--------------------|-----------------|
|                  | S,P,H high school | National Jr. college | College canteen | N.B. Mehta college |                 |
| Temperature      | 26C               | 25C                  | 26C             | 25C                | -               |
| pH               | 6.7               | 6.9                  | 6.75            | 6.8                | 6.5-9.2         |
| Acidity          | 345mg/l           | 255mg/l              | 325mg/l         | 305mg/l            | -               |
| Alkalinity       | 185mg/l           | 182mg/l              | 135mg/l         | 205mg/l            | 200ppm          |
| Dissolved Oxygen | 34mg/l            | 35mg/l               | 28mg/l          | 40mg/l             | 30ppm           |
| Total Hardness   | 302.56mg/l        | 356mg/l              | 253.08mg/l      | 346.58mg/l         | 300ppm          |
| Calcium          | 35.7mg/l          | 33.67mg/l            | 41mg/l          | 28mg/l             | -               |
| Chloride         | 153.1mg/l         | 140.16mg/l           | 80.52mg/l       | 170.98mg/l         | 250ppm          |
| Total Solids     | 0.016gm           | 0.014gm              | 0.017gm         | 0.009gm            | -               |
| TDS              | 0.006gm           | 0.006gm              | 0.009gm         | 0.005gm            | -               |
| TSS              | 0.010gm           | 0.008gm              | 0.008gm         | 0.004gm            | -               |
| Sulphate         | 140ppm            | 138ppm               | 122ppm          | 172ppm             | 200ppm          |

### Microbial analysis:

#### Presumptive test :

The given sample of potable water was analysed by multiple tube fermentation technique. Presumptive test on day 1-showed acid and gas production in lactose broth with andrades

indicator giving on MPN of  $\geq 1600$  Org/100 ml. Since the MPN count of coliform was more than normal i.e. 10 org/100ml, it showed that coliform is present on day-2 confirm test was performed by using EMB and endo agar and gas production in the BGLB confirm the presence of coliform. This was followed by completed test where typical coliform colonies were streaked on NA slant and gas production was observed in lactose broth. Hence, completing the confirmation of coliform bacteria.coliform have diff effect on our body and hence it is essential to detect the type of coliform in water. This was done by IMVIC test. Which showed positive indole, Methyl red, simmon's - citrate test and voges - prosker's test. Hence, we conclude that given water sample is contaminated with faecal matter and hence, it is not fit for consumption and thus changes should be made in purification method. Disinfection like  $Cl_2$  should be used to improve the quality of water.

| Medium in ml                               | Tube no.1               | Tube no.2               | Tube no.3               | Tube no.4               | Tube no.5               | Amount of water sample added ml |
|--------------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------------|
| 10ml sterile Double strength lactose broth | Acid and gas production | Acid and gas production | Acid and gas production | Acid and gas production | Acid and gas production | 10 ml                           |
| 10ml sterile Single strength lactose broth | No change observation   | Acid and gas production | Acid and gas production | Acid and gas production | Acid and gas production | 1 ml                            |
| 10ml sterile Single strength lactose broth | Acid and gas production | Acid and gas production | Acid and gas production | No change observation   | No change observation   | 0.1 ml                          |

## MPN Chart:

### 1] By calculation:

= No. of positive tubes\*100/ $\sqrt{\text{total sample in Negative tubes*total sample in test}}$

=  $12*100/\sqrt{1.2*55.5}$

=  $1200/\sqrt{116.55}$

=  $1200/8.16$

= 147.05 org /100ml

### 2] By Macardy's chart:

By comparing Macardy's chart number of organism/100ml to be 180 org/100ml.

## Colony Characteristic:

### 1] Endo agar:

#### N.B.Mehta College

#### National Jr. College

|                 |               |                 |               |
|-----------------|---------------|-----------------|---------------|
| Size            | 4mm           | Size            | 4mm           |
| Shape           | Round         | Shape           | Round         |
| Color           | Pink          | Color           | Pink          |
| Elevation       | Flat          | Elevation       | Flat          |
| Margin          | Smooth        | Margin          | Smooth        |
| Opacity         | Opaque        | Opacity         | Opaque        |
| Surface Tension | Smooth        | Surface Tension | Smooth        |
| Consistency     | Sticky        | Consistency     | Sticky        |
| Gram Nature     | Gram positive | Gram Nature     | Gram positive |

**College Canteen**

**S.P.H. High school**

|                 |               |                 |                |
|-----------------|---------------|-----------------|----------------|
| Size            | 4mm           | Size            | 4mm            |
| Shape           | Round         | Shape           | Round          |
| Color           | Pink          | Color           | Pink           |
| Elevation       | Flat          | Elevation       | Flat           |
| Margin          | Smooth        | Margin          | Smooth         |
| Opacity         | Opaque        | Opacity         | Opaque         |
| Surface Tension | Smooth        | Surface Tension | Smooth         |
| Consistency     | Sticky        | Consistency     | Sticky         |
| Gram Nature     | Gram positive | Gram Nature     | Gram positive+ |



**2] EMB Agar (Eosin methylene Blue Agar):**

**N.B.Mehta College**

**National Jr. College**

|                 |               |                 |               |
|-----------------|---------------|-----------------|---------------|
| Size            | 1mm           | Size            | 1mm           |
| Shape           | Round         | Shape           | Round         |
| Color           | Green         | Color           | Green         |
| Elevation       | Flat          | Elevation       | Flat          |
| Margin          | Eract         | Margin          | Eract         |
| Opacity         | Translucent   | Opacity         | Translucent   |
| Surface Tension | Smooth        | Surface Tension | Smooth        |
| Consistency     | Non-Sticky    | Consistency     | Non-Sticky    |
| Gram Nature     | Gram negative | Gram Nature     | Gram negative |

## College Canteen      S.P.H.High School

|                 |               |                 |               |
|-----------------|---------------|-----------------|---------------|
| Size            | 1mm           | Size            | 1mm           |
| Shape           | Round         | Shape           | Round         |
| Color           | Green         | Color           | Green         |
| Elevation       | Flat          | Elevation       | Flat          |
| Margin          | Eract         | Margin          | Eract         |
| Opacity         | Translucent   | Opacity         | Translucent   |
| Surface Tension | Smooth        | Surface Tension | Smooth        |
| Consistency     | Non-Sticky    | Consistency     | Non-Sticky    |
| Gram Nature     | Gram negative | Gram Nature     | Gram negative |

### 3.Complete Test:

#### IMVIC Test:

##### 1] Indole test:

**Result: Reddish color ring is obtained at the junction.**

##### 2] Methyl Red test:

**Result: Red color was seen.**

##### 3] Voges-Prosker's test:

**Result: Red color observed.**

##### 4] Sodium Citrate Test:

**Result: Medium Turn Green from Blue.**

## Conclusion:

The given sample of potable water was analysed by multiple tube fermentation technique. Presumptive test on day 1-showed acid and gas production in lactose broth with andrades indicator giving on MPN of  $\geq 1600$  Org/100 ml. Since the MPN count of coliform was more than normal i.e. 10 org/100ml, it showed that coliform is present on day-2 confirm test was performed by using EMB and endo agar and gas production in the BGLB confirm the presence of coliform. This was followed by completed test where typical coliform colonies were streaked on NA slant and gas production was observed in lactose broth. Hence, completing the confirmation of coliform bacteria.coliform have diff effect on our body and hence it is essential to detect the type of coliform in water. This was done by IMVIC test. Which showed positive indole, Methyl red, simmon's - citrate test and voges - prosker's test. Hence, we conclude that given water sample is contaminated with faecal matter and hence, it is not fit for consumption and thus changes should be made in purification method. Disinfection like  $Cl_2$  should be used to improve the quality of water.

The water sources considered for this study have been used for drinking purpose. All the data were compared with standard values for potability of drinking water On the basis of the above discussion, it may be concluded that the drinking water at almost all the bordi area is potable.The great majority of evident water related health problems are the result of microbial contamination. Nevertheless, an appreciable number of serious health concerns may occur as a result of the chemical contamination of drinking water. This study concluded that the potable water quality in Bordi area, needs a serious effort in limiting the numbers of microbial organisms released into the system. The microbial level render them unfit for human consumption though they can be used for other purposes water should meet different quality specification depending on the particular uses.

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