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The Assessment Of Water Quality In Solapur, Maharashtra With Reference To Microbial Parameter

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Abstract

Water pollution is a major problem and it is the leading worldwide cause of death and disease that account for the deaths of more than 14,000 people daily. The global contest 1000 Indian children die of diarrheal sickness every day, same 90% of China cities suffer from some degree of water pollution and nearly 500 million people lack access to safe drinking water, According to the world health organization diarrheal disease accounts for an estimated U.S.I. of the total global burden of 1.8 million people every year. Most of studied parameters are beyond ISI limits of drinking water which indicate a bad sign in water quality. Also the presence of bacterial flora alerts the areas of drinking water. During the study ofwater sample of hand pump and well if amount of chloride higher than ISI limits hypocloride of chlorine will indicate organic pollution. If the amount of total dissolved solid higher than ISI limit alum salt will used for water treatment. If the amount of calcium and Magnesium higher then ISI limit settlement of water for overnight is the treatment method. Red not brick placed in water used for treatment of microbial flora. Sewage disposal affects people for water related illness such as diarrhea.

Keywords: *Waterpollution, Bacterialflora, Organicpollution,*

Introduction : Water is a chemical compound withthe chemical formula H_2O. A watermolecule contains one oxygen and twohydrogen atoms with covalent bonds. Water is aliquid at standard ambient temperatureand pressure, but it often co-exists on Earthwithits solid state, liquid and gaseousstate.

Water is one of the mostimportant substances on earth. All plants andanimalsmust have water to survive. If there wasno water there would be no life on earth. Water is also essential for the healthy growth of farm crops and farm stock and is used in the manufacture of many products.

Physical impurities impart colour, taste, odor and turbidity to the water, chemical impurities cause hardness and water pollution. Excess quantities of metal and dissolved gases cause corrosion of pipes and fittings. Bacteriological impurities are due to pathogenic bacteria which spread disease such as cholera, diarrhea and dysentery. The most important industries which are

Responsiblefor water pollution in India is chemical and pharmaceutical, pulp and paper, sugar, distilleries, textiles, steel mills, oil refineries, etc. The arrangement for property organizing the hydrosphere in order to avoid is called water crises in future water management. Chakraborty, 2004 had been studied water utilities in the Netherlands aim at controlling the multiplication of (micro-) organisms by distributing biologically stable water through biologically stable materials, Disinfectant residuals are absent or very low. We all know that water is the life matter and matrix and without it life cannot exist. It gives us the evolution and functions of universe on the earth hence water is Mother of all living world. Majority of water available on the earth is

saline in nature; only small quality exists as fresh water. Fresh water has become a scare commode due to over exploitation and pollution (Ghosh*et al*., 1968; Gupta and Shukla,2006; Patil and Tijare, 2001; Singh and Mathur, 2005). Industrial, sewage and municipal wastes are being continuously added to water reservoirs affect physiochemical quality of water makingthem unfit for use of livestock and other organisms (Dwivedi and Pandey, 2002; Chaurasia and Pandey, 2007). A major problem in urbanized areas is the collection and disposal of domestic wastes (Kolade, 1982). Because a large volume of sewage is generated in a small area, thewaste cannot be adequately disposed of by conventional septic tanks and cesspools. Theintensive use of natural resources and the large production of wastes in modern society often pose a threat to ground water quality and have already resulted in many incidents of ground water contamination (Chakrabortyet *al*, 1959; Rao*et al.,* 1999, Edema *et al.,* 2001).

Ground water pollution

The source of bacteria in ground water is the contaminated surface water or indigenousbacteria spread to ground water. No matter what the sources of bacteria but the bacteria and their biological processes affect the quality of our ground water. The purpose of this study is to identify pathogenic bacteria and its roles in ground water. Access to safe drinking water is indicated by the number of people using proper sanitary source (Okonko*et al.,* 2008). These improved drinking water sources include household connection, public stand pipe, boreholecondition, protected dug well and protected spring and rain water collection. Sources that don't encourage improved drinking water to the same extent as previously maintained include unprotected wells, springs, rivers and ponds (Rao*et al.,* 1999).

1. Collection of Sample 250 ml capacity Bottles were used for water collection.

2. Determination of colour: 50ml water sample taken in a 150ml Erlenmeyerflask and observed against light for any colour and appearance. It was found colorless.

3. Determination of odor: 50ml cooledsample taken in a 150ml of Erlenmeyerflask and observed for any smell. It was found odorless.

4. Determination of taste: 50ml watersample taken in a 150ml of Erlenmeyerflask and observed for any taste. It was found water like taste.

5. Determination of pH: 50ml watersample taken in a 150ml of beaker andwith the help of pH meter electrodedipped into water sample and observedfor pH values.

6. Determination of total hardness:

50ml of sample in Erlenmeyer flask and1ml of ammonia buffer solution and 4-5drops of eriochrom black-T indicator was taken. Titrated with EDTA solutionand observed for red wine colour changed to blue.

7. Determination of total dissolved solid:

An evaporating dish of suitable size wastaken and weighed. 50ml Sample wasfiltered through a filter paper and thefiltrate is evaporated in evaporating dish.Evaporated sample was placed on hotwater both, when whole water isevaporated; the weight of evaporatingdish was noted after cooling it indesiccators.

8. Determination of calcium hardness:

50ml of sample in Erlenmeyer flask wastaken and sodium hydroxide solutionand a pinch of murexide indicator were added to the sample. Titrated againstEDTA solution and observed the pink colour changed to purple colour.

9. Determination of total alkalinity:

50ml of sample in Erlenmeyer flask wastaken and 2-3 drops of phenolphthaleinindicator was added. Pink colourdeveloped. This solution was titratedagainst sulfuric acid (2.02N) until solution becomes colourless. 2-3 dropsof methyl orange indicator was added inthe same flask and titrated continuouslyagainst sulfuric acid and observed the yellow colour solution changed to orange.

10. Determination of chloride

10ml sample in an Erlenmeyer flask wastaken and 5-6 drops of potassiumchromate indicator was added, the colour of sample became yellow and titratedagainst silver nitrate solution and observed the appearance of brick red colour.

11. Determination of electricalconductivity

50ml of sample in a beaker was takenand an electrode was dipped in to it. Thecalibration and changes made on theelectrical conductivity was noted downwith the reading on display of device.

12. Determination of total salt

50ml of sample was taken in beaker anddipped the electrode and the changemade on total salt was then noted downwith the reading on display of device.

13. Streak plate method

Streak plate method was developed bytwo bacteriologists, **Loffler** and **Gaffkey** in the laboratory of **Robert Koch.** It ismost practical method of obtaining discrete colonies and pure culture.

Determination of total coli form bacteriaby multiple tube or serial dilution method

One ml water sample was poured into sterilescrew cap tube having 10ml of lactose broth and Durhams tube was placed in it in theinverted position. Tube was incubated at37^{0}C for 48 hrs. After incubation, it was observed for gas production.

Microbiological techniques

Determination of TBC (Total BacterialCounts)

A. By pour plate technique

1ml water sample poured into sterileplate, 15ml SCDA agar was poured. Aftersolidification plates were kept in invertedposition at 37^{o}C (35 + 2^{0}C) for 48 hrs.Positive plates were counted with thehelp of digital colony counter. Multipletube or serial dilution method was usedfor total coliforms with using lactosebroth at 35 + 2^{o}C for 48 hrs.

B. Test for specified microorganisms

Salmonella 1g or 1ml of the samplewas added to 10ml of nutrient broth in asterile screw capped jar, shacked, allowedto stand for 4 hours and shacked again toloosen the cap and incubated at 35^{0}C37^{0}C for 24 hours.

Primary test:

10.0ml of the enrichment culture was addedto each of the two tubes containing (a)10ml of selenite F broth and (b) tetrathionate- bile- brilliant green broth andincubated at 36^{0}C-38^{0}C for 48 hours, fromeach of these two cultures subculture on at least two of the following four agar medium,four agar media: bismuth sulphite agar,brillinat green agar, desoxycholate-citrateagar and xylose-lysine desoxycholate agarwas made.

Membrane Filtration technique:

1000ml of water sample was filtered througha Sartorius filter membrane (0.45 µmporesized). The membrane was placed into the enrichment broth and incubated at 37^{0}C for18 hrs. After incubation a small inoculums was streaked on selective enriched agarplates for specific pathogens i.e. for *Staphylococcus aurous*:

A. *Staphylococcus* enrichment broth.

B. *Staphylococcus* enrichment agarplates.

Positive growth in specific medium showed the presence of pathogenic bacteria.

Dysentery may be caused by *Shigella,Salamonella*, *Entamoebahistolytica* and some viruses. *Shigellaflexneri* and *Shigelladysentery* have been isolated from monkeysin captivity and from day.

Results and Discussion

Given water samples were colourless,odourless, and tasteless. The pH was foundto be higher (6.85) in hand pump water of Chincholi village and was lower in hand pump water of Gulwanchi village i.e. 6.38.The total hardness were found to be higher in sample of Kondi village hand pump (372mg/l) and lowest total hardness were foundin hand pump water of Chincholi village i.e. 220 mg/l, indicating the water is little bithard in compound. The calcium hardnesswere found towards higher in hand pump water of Kondi village i.e. 207.9mg/l andlower calcium hardness were found in hand pump water of Chincholi village i.e.37.9g/l. The total dissolved solids werefound to be higher in hand pump water (342mg/l) of Kondi village and were lower in sample of Chincholi village i.e. 191mg/l.The magnesium hardness was found to bemaximum in hand pump water of Akolekatti village i.e. 273.3mg/l and minimummagnesium hardness was found in hand pump water of Kondi village i.e. 68.1mg/l**.**The chloride was found towards higher sidein hand pump water of Gulwanchi village i.e. 225mg/l and lower chloride was found inhand pump water of Akolekatti village 7.09mg/l indicates no organic pollution. The electricalconductivity was found to be maximum inhand pump water of Gulwanchi village hand pump 415 mg/l and minimum electricalconductivity was found in hand pump water of Akole katti village i.e. 171mg/l. The totalalkalinity ware found to be high i.e. 320mg/l in Govt. Hand pump water Gulwanchi village hand pump and low total alkalinitywas found in well water of Kondi village80mg/l and are within limits.High Yeast mould- 27 = Akolekatti village, Low Yeast Mould -19 = Kondi village, High Total Coli form - 210 = Kondi village, Low Total Coli form - 36 = Chincholi village.The *Staphylococcus aurous* in out of five samples was showed positive result in threesamples and negative result in two samples.The *Salmonella* was studied in five samplesand it was positive result in two samples andnegative result in three samples. The totalcoliform was found to be maximum in handpump sample i.e. 210 mg/l and minimumtotal coliform was found in hand pumpsample i.e. 36 mg/l. Most of these abovestudied parameters are beyond ISI limits ofdrinking water which indicates a bad sign inwater quality. Also the presence of bacterialflora alerts the areas of drinking water.

Table.1 Physico-chemical characters of different drinking water sample in around Solapur

SN	Parameter	Drinking water sample				I[st] limits	Ref. method
		A	B	C	D		
1	Colour	Colourless	Colourless	Colourless	Colourless	2	Work book of limnology A.D. Adony 1985
2	Odour	Odourless	Odourless	Odourless	Odourless	Agreeable	
3	Taste	Tasteless	Tasteless	tasteless	tasteless	tasteless	
4	pH	6.85	6.38	6.75	6.65	6.5 to 8.5	
5	Temp	20^0C	24^0C	23^0C	23^0C		

Table.2 Physico-chemical parameter of different drinking water sample in around Solapur

SN	Test parameter	Drinking water sample A	B	C	D	Ist limits	Ref. method
1	Total dissolved	191 mg/l	337 mg/l	251mg /l	342mg/ l	500mg/ l	1. Work book of limnology A.D. Adony 1985 2. Drinking water specification third reprint October 1996
2	Total hardness mg/l	220 mg/l	292 mg/l	322 mg/l	372 mg/l	300 mg/l	
3	Calcium hard. mg/l	37.90 mg/l	163 mg/l	38.7 mg/l	207 mg/l	75 mg/l	
4	Magnesium hard.	182.1 mg/l	128 mg/l	273 mg/l	68.1 mg/l	30 mg/l	
5	Total alkalinity mg/l	200 mg/l	320 mg/l	120 mg/l	80 mg/l	80 mg/l	
6	Chloride mg/l)	113 mg/l	255 mg/l	7.09 mg/l	42 mg/l	78.0 mg/l	
7	Elect. conductivity	271 mg/l	415 mg/l	171 mg/l	373 g/l	478 mg/l	
8	Total salt	148 mg/l	226 mg/l	260 mg/l	197mg/ l	264 mg/l	

A= Chincholi village **B**= Gulwanchivillage**C**= Akolekatti village **D**= Kondi village

Table.3 Occurrence of microbial flora in different drinking water sample

Parameter	Drinking water sample A	B	C	D	Ist limits
Total bacterial count	42	36	107	98	50
Yeast mould	11	12	27	19	Absent
Total coli form by MPN Technique	36	78	209	210	Absent

Table.4 Detection of pathogenic bacteria in different drinking water samples

Sr.No	Pathogenic Bacteria	A	B	C	D	Result	
1	*Staphylococcuaurous*	-	-	+	+	Absent	Medical bacteriology (eight ceition) by N.C. Dey& T.K. Dey 1975
		+	-	+	+		
2	*Salmonella* sp.	+	-	+	+	Absent	
		+	-	+	+		

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