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Study of Drinking Water Quality Supplied At Major Railway Stations in South Gujarat

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ABSTRACT

Water is the necessity of any living species on the earth. We even cannot imagine our life without unavailability of water in our daily routine. Our body contains 70% of water inside it and it plays a crucial role to make our body healthy and workable. But the public places like railway stations, bus stations, public parks, etc. the water facility is not proper and not fit for drinking purpose. A study was carried out to evaluate the quality of drinking water supplied at major railway stations in south Gujarat. Water sample were connected from the tap water sources making at total of 2 sampling points of south Gujarat railway station. There were Bharuch , surat , valsad and vyara railway stations. Two set of sample collected ,which is one during monsoon and other one is after the monsoon where taken from each sampling point. Four physiochemical parameters [pH, colour, turbility, hardeness] and bacteriological parameters where tested for each sample and value compared with WHO guideline for drinking water. Analysis will carried out and suitable measure will take to make drinking water source free from pollution .
Keywords: Water Quality, Physicochemical Characteristics; Bacteriological Characteristics.

I. INTRODUCTION

Our planet Earth is a live planet because of some special ingredients out of which water plays a great role. Water has been considered as the most important and vital resource for the upbringing of the biological sphere as well as the human civilization. The other agents, which are responsible for the biosphere on globe, are Air, Heat, Soil and Sky. All these agents are linked in between themselves to a much greater extent and any irregularities in one of them affects others as well. Along with the progress of our civilization, this resource has begun being polluted and its quality started depleting due to various reasons like the onset of industry, domestic wastes, runoff from urban areas, urban and rural garbage.

With the onset and progress of human civilization, it has constantly been observed that the coastal areas as well as the river banks have been the most populated spots on account of the availability of ample water resources for the maintenance of daily life along with farming and other climatic advantages. The cities and towns always have shown a rising trend of population because of the easy earning sources due to the various industries which are set up to meet the increasing demand of the growing civilization. Because of this, day by day the urban areas are being more densely populated and as a result, the surrounding areas of the cities are suffering from various kinds of pollutions like the air pollution, water pollution, soil pollution and many more due to the sewage, garbage, dumps and barnyard manures etc.

Railway stations are the main source of drinking water for railway travelers and analysis of water is very important in the evaluating of these supplies. A large number of railway passengers consume this drinking water on railway platform and this contaminated water may be the vehicle of transmission of water born diseases [1]. Drinking water at railway stations is mainly supplied from bore wells. Most of the railway stations in India rarely have the much needed purifying technology [2]. Water quality assessment helps in identification of any contaminants and checks the quality of water. As one of the essential amenities local government authorities provide drinking water to passengers at all the stations. But many times apathy

has been observed towards the quality maintenance of water, storage tanks and particular area [3]. This work seeks to check the quality of water made available at the public transport stations on various stations such as Valsad, Surat, Vyara, Bharuch.

Table:1 Sampling Schedule

Season	During Monsoon (Phase-1)		Post Monsoon (Phase-2)	
Testing. No	1.	2.	3.	4.
Month	August	October	January	February
Date	24-25/08/2015	5-6-7/10/2015	20-21-22/2/2016	28/3/2016

II. METHODS AND MATERIAL

2.1 Parameters Tested

Six water quality parameters; 13 physico-chemical and 3 bacteriological were tested for the samples collected for this research work. These parameters play an important role in the disinfection of water. Turbidity should be less than 0.5 Nephelometric Turbidity Units (NTU) and pH should be less than 8 for effective disinfection [10].

Table 2. Details of sampling location

Sr. No.	Sample Collection Area	Taluka-District	Latitude	Longitude
1.	Valsad Railway Station	Valsad	20.6078° N	72.9335° E
2.	Surat Railway Station	Choryasi - Surat	21.2049° N	72.8406° E
3.	Bharuch Railway Station	Bharuch	21.7033° N	72.9992° E
4.	Vyara Railway Station	Vyara – Tapi	21.1183° N	73.3836° E

Chemical parameters chosen were hardness and total dissolved solids (TDS). Water with high hardness results in excessive use of soap for washing purposes in household use while water with high TDS may impart taste. High values of both these parameters also result in scale deposition in pipes and utensils. Bacteriological parameters tested were total coliform (T.C) and faecal coliform (F.C) [10-11]. These parameters indicate the possibility of the presence of pathogenic bacteria in the supplied water. All the tests were conducted according to the procedures laid down in the Standard Methods [11].

2.2 Sampling Area

South Gujarat Railway Sations was selected for the purpose of this study as a test case. It mainly consistd Valsad, Surat, Bharuch and Vyara Railway Stations.

2.2 Sampling Methodology

From each sampling location, samples were collected before and after the monsoon as recommended in WHO guidelines. For statistical significance of the test results, each sampling location was sampled two times before and two times after the monsoon on the dates as shown in Table 2. On a specific date, samples from all the sampling locations were collected. In this way a total of 16 samples were collected and tested during this study. Mean values of the quality parameters for the three samples at each sampling point before and after the monsoon are reported in this paper.

For physicochemical analysis, water samples were collected in a one liter polyethylene (PET) bottle while a 0.5 liter sterilized PET bottle was used to

collect sample for bacteriological analysis. In case of water samples from the distribution system, un-rusted taps supplying water from a service pipe, directly connected to the main and not served from the household storage tank, were selected. Samples were not taken from those taps which were leaking between the spindle and gland to avoid outside contamination. Taps were opened fully and let run for 2 to 3 minutes before sampling to get a truely representative sample from both the source and the distribution system.

III. RESULTS AND DISCUSSION

Drinking Water Standards

Table 3. Drinking water standards

Sr. No	Parameters	Permissible value	Standard
1.	Color	Unobjectionable	IS: 10500
2.	Taste	Agreeable	IS: 10500
3.	pH	6.5-7.5	IS: 10500
4.	Turbidity	5	IS: 10500
5.	TDS	500	IS: 10500
6.	TSS	5	USPHS
7.	BOD	Nil to 5	USPHS
8.	DO	4.0 to 6.0	USPHS
9.	Total hardness	300	IS: 10500
10.	Chloride	250	IS: 10500
11.	Alkalinity	120	USPHS
12.	Residual chlorine	0.2	IS: 10500

3.1 Results

3.1.1. pH

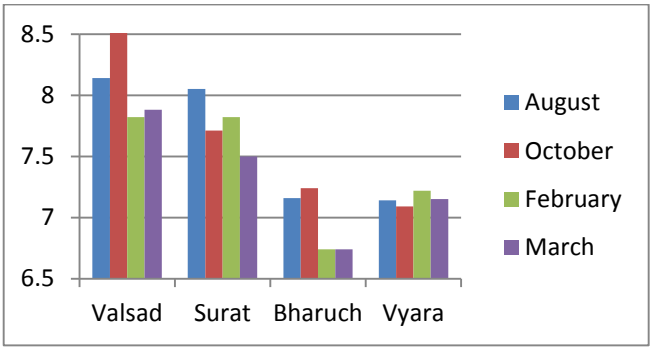

Figure 2: Average pH of the water samples from different Railway Station

3.1.2 Total Dissolved Solids (mg/l)

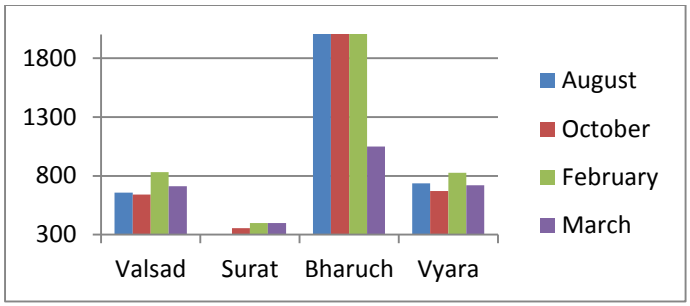

Figure 3: Average Total Dissolved Solids of the water samples from different Railway Station

3.1.3. Total Hardness (mg/l)

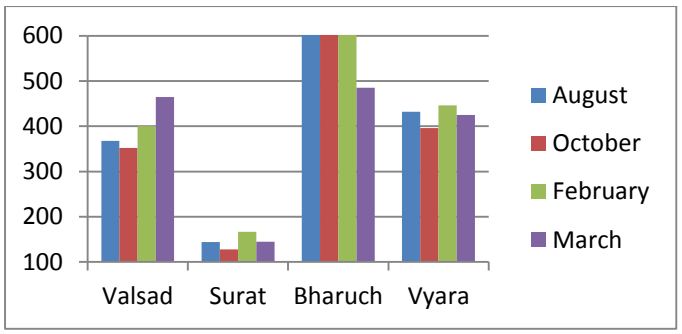

Figure 4: Average Total Hardness of the water samples from different Railway Station

3.1.4. Calcium (mg/l)

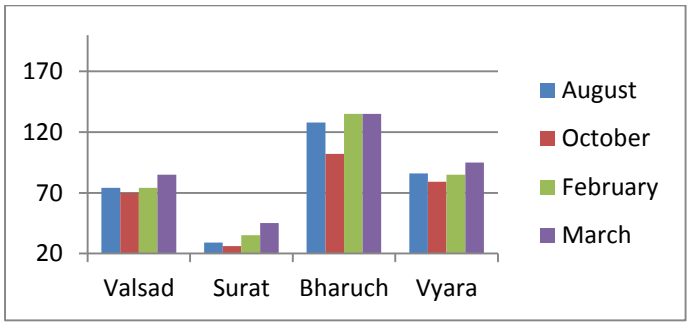

Figure 5: Average Calcium of the water samples from different Railway Station

3.1.5. Magnessium (mg/l)

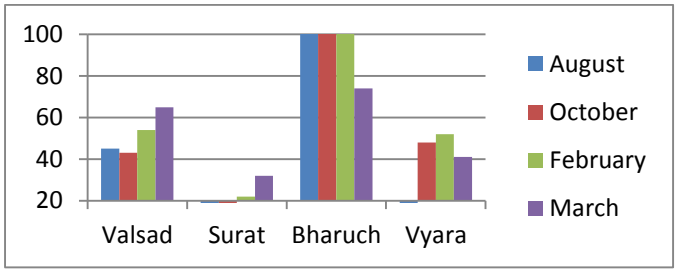

Figure 6: Average Magnessium of the water samples from different Railway Station

3.1.6. Chloride (mg/l)

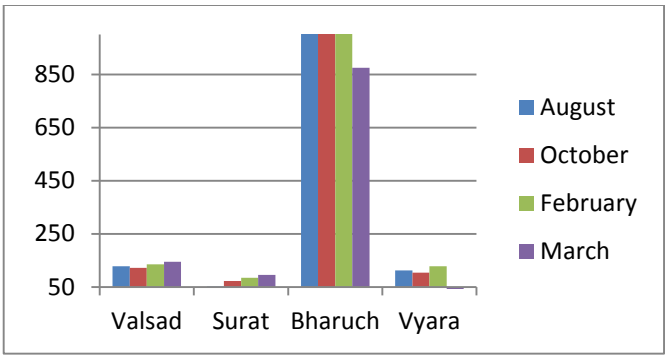

Figure 7: Average Chloride of the water samples from different Railway Station

3.1.7. Sulphate (mg/l)

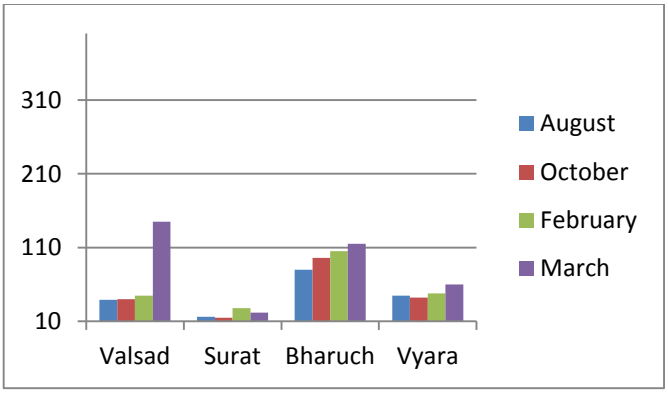

Figure 8: Average sulphate of the water samples from different Railway Station

3.1.8. Nitrate (mg/l)

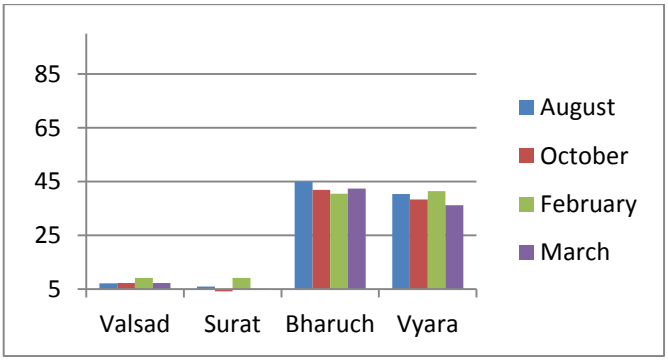

Figure 9 : Average Nitrate of the water samples from different Railway Station

3.1.9. Fluoride (mg/l)

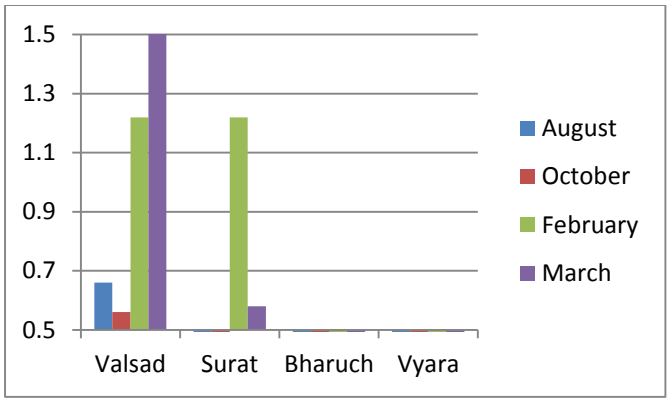

Figure 10 : Average Fluoride of the water samples from different Railway Station

3.1.10. Total Alkali (mg/l)

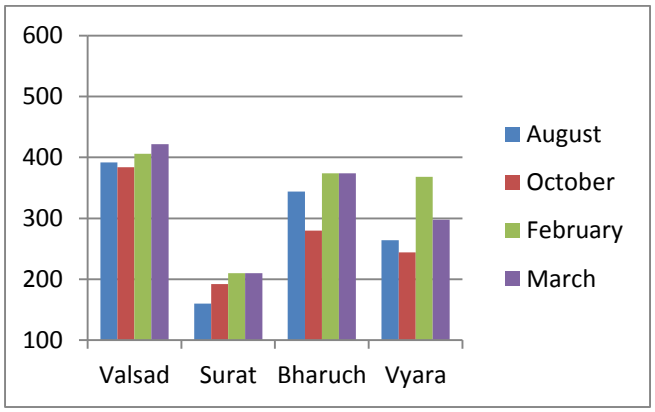

Figure 11 : Average Total Alkali of the water samples from different Railway Station

IV. CONCLUSIONS & RECOMMENDATIONS

[1]. The physicochemical (pH, turbidity, hardness and TDS) and bacteriological (T.C and F.C) parameters at all the sources (T/W) in the study area were within the limits prescribed by WHO guidelines for drinking water quality. It can, therefore, be concluded that Water in the study area is suitable for drinking.

[2]. Physicochemical quality of the sampled water at all the stations was within the limits prescribed by WHO guidelines.

[3]. To improve the bacteriological quality of water, it is recommended to make the installed chlorination devices functional. Tubewell operators must be trained to use these devices properly and to administer proper dose of

chlorine.

[4]. Avoid pounding of wastewater in the railway stations area through effective wastewater collection system.

[5]. Very old/leaking pipes need to be replace/repaired to avoid bacteriological contamination.

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