International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

A Study on Quality Assessment of Potable Water in Greater Bajali Area, under Barpeta District, Assam

Trishna Barman
Bajali College, Pathsala
Smriti Barman
Bajali College, Pathsala

ABSTRACT

Fresh water is a natural resource of fundamental importance. The qualities of fresh water is unique and supports life. The study is undertaken to examine the quality of potable water in greater Bajali area. The study involves various tests examining the level of pH, alkalinity total hardness, dissolved water, dissolved carbon-di-oxide, calcium, magnesium and chlorine with water sample taken from four different studied area. The obtained result is compared with 'WHO' desirable limit for different parameters along with Indian Standard (IS). And it is found that most of the parameters lie within the WHO and IS desirable limit. Some are not fulfilling the WHO value but fulfill the IS value and vice-versa. Over all the study shows that all the values are almost near the standard range indicating the safety of the potable water in the studied area.

KEYWORDS: POTABLE WATER, WHO STANDARD, INDIAN STANDARD.

INTRODUCTION

Fresh water is a natural resource for fundamental importance. Quality of fresh water plays an unique role as it supports life on earth. Although a huge quantity of water is available on the planet about almost 1500 million cubic kms (1) but most of this is useless due to presence of large amount of salt. Total amount of fresh water in earth is 84.4 million cubic kms. The term potable water is used to mean the water which is fit for consumptions by humans and animals. It is also called as drinking water. Water may be naturally potable as in case with pristine spring; or it may be needed to be treated in order to be safe. Water which is not safe to drink can cause various diseases. The most important purpose is the drinking water which is defined in law by standards for a wide range of substances, organisms and properties of water in regulation. The standards for drinking water is documented by "WORLD HEALTH ORGANISATION (WHO)". These standards are strict and include wide safety margins. "NATIONAL RURAL DRINKING WATER PROGRAMME (NRDWP)-movements towards ensuring people's drinking water security in rural India, modified in 2009, during its 12^{th} year plan in 2013 defined water as safe if it is free from biological contamination (guinea worm, cholera, typhoid) and within permissible limit of chemical contamination (excess fluride, iron, arsenic, nitrates) as per IS-10500 standard of BIS as revised in 2012. Under this project five different states were listed out with almost 60 of their districts that were seriously affected with Japanese Encephalitis and Advanced Japanese Encephalitis. 1o districts from Assam were listed out which also include the present study area Barpeta district (2). The ground water quality of Assam is found to be feebly alkaline with low calcium, magnesium, sodium, potassium, chloride and sulphate content. There is a high content of iron that is usually filtered by domestic local filters made at home. The issue of access to potable water is very much important, as people are not so much concern about the safety of their source of water. The present hypothesis of this work is also based on important issues regarding the potable water. PATHSALA, is a developing town whose growth can be ascribed principally for being an important service center of the whole BAJALI AREA of BARPETA district. The main aim regarding this work is to establish a standard account for quality of potable water of Bajali Area in consideration with four studied areas

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

by analyzing its parameters and considering the values with the standards established by WHO.

MATERIALS AND METHODS

ABOUT THE STUDY AREA

Bajali Area is located at the intersection of 26˚29/45//N latitude and 91˚09/45//E longitude. This area has experienced sub-tropical climate with average annual rain fall 164 cm and mean annual temperature 22.4˚ c, maximum temperature being 37˚c and minimum 7.8˚c. Present work is carried out from four major areas of this region- Jyotinagar, Lachitnagar, Krishnanagar, Bhattadevnagar to analyze the drinking water quality taking the sample water from untreated tap, tube well and pond of these four areas.

METHODS

A total of twelve samples are collected during the month of March and April, 2017 from four different ward of Pathsala town. The water samples are collected in pre-cleaned polythene bottles and stored for further analysis. The pH, dissolved oxygen (DO), dissolved carbon-di-oxide (DCO2) are measured immediately after sampling and other parameters are determined in the laboratory following standard analytical procedure. The suitability of water used for drinking purposes are evaluated by comparing the values of different water quality parameters with BIS (Bureau of Indian Standard) and WHO (World Health Organization) guideline values. The instruments are calibrated and standardized before carrying out the analysis.

A. pH is measured by using pH paper and pH meter.

B. Total alkalinity of the water sample is determined by titrating against 0.1HCl (N) to methyl orange and phenolphthalein indicator to the end point.

C. Total hardness as the concentration of calcium (ca) and magnesium (Mg) is determined by EDTA (Ethylene Diamine Tetra acetic acid) Titrimetric Method.

D. Dissolved oxygen in the water sample is measured by employing ‘Wrinkler Method’ (3).

E. Dissolved carbon-di-oxide in the water sample is determined by titrating with sodium hydroxide to phenolphthalein to the end point.

F. Chlorine content is determined by titrating against 0.02N AgNO3 (silver nitrate solution).

All the methods and the formulas used for the tests are described in (4) and standardized by Indian Standards (IS).

OBSERVATION

Observations during the various tests with the water sample (untreated tap water, tube well water, and pond water) of the four studied area are represented on the following tables-

Table.1: Different parameter for the tape water (untreated) studied area

Parameter	Jyotinagar	Lachit nagar	Krishnanagar	Bhattadevnagar
pH	5	5	5	5
Alkalinity(mg/l)	455	505	495	451.5
Total hardness(mg/l)	184.3	200	201.67	181.67
Dissolved oxygen(mg/l)	5.0	5.23	5.13	4.93
Dissolved carbon-di-oxide(mg/l)	16.3	18.3	19.3	14.7
Calcium(mg/l)	133.7	150.15	149.1	131.57
Magnesium(mg/l)	12.35	12.16	12.83	12.3
Chlorine(mg/l)	14.2	14.63	14.67	10.934

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

Table.2: Different parameters for tube well water (untreated) in the studied area

Parameters	Jyotinagar	Lachitnagar	Krishnanagar	Bhattadevnagar
pH	5	5	5	5
Alkalinity(mg/l)	510	605	601.65	498.5
Total hardness(mg/l)	213.3	223.3	221.33	211.67
Dissolved oxygen(mg/l)	5.7	7.76	5.73	5.6
Dissolved carbon-di-oxide(mg/l)	29.3	29.6	29.3	27.7
Calcium(mg/l)	148.4	158.86	158.87	146.69
Magnesium(mg/l)	15.83	15.72	15.24	15.86
Chlorine(mg/l)	16,62	16.05	15.62	14.2

Table.3: Different parameters for pond water (untreated) in the studied area

Parameters	Jyotinagar	Lachitnagar	Krishnanagar	Bhattadevnagar
pH	5	5	5	5
Alkalinity(mg/l)	60	63.33	58.33	55
Total hardness(mg/l)	81	83	83.33	79
Dissolved oxygen(mg/l)	8	8.2	8.23	7.9
Dissolved carbon-di-oxide(mg/l)	7	8.3	8	6.67
Calcium(mg/l)	73.5	72.45	71.72	68.57
Magnesium(mg/l)	2.6	2.58	2.84	1.32
Chlorine(mg/l)	21.3	22.57	24.57	19.88

RESULT AND DISCUSSION

Results obtained for different parameters and for different samples are as follows-

The pH value is found to be average 5 for all the three samples of water collected from the four studied areas. Alkalinity for tap water is found in the range from 451.5mg/l to 505mg/l, for tube well water from 498.5mg/l to 605mg/l and for pond water from 55mg/l to 63.33mg/l in the four studied areas. Total hardness is found from 181.67mg/l to 191.91mg/l for tap water, from 211.67mg/l to 223.3mg/l for tube well water and from 79mg/l to 83.33 mg/l for pond water in the four areas. For DO value the range is from 4.93mg/l to 5.23mg/l in tap water, from 5.6mg/l to 5.76mg/l in tube well water and from 7.9mg/l to 8.23mg/l in pond water for the studied areas. DCo2 value ranges from 14.7mg/l to 19.3mg/l in tap water, 27.7mg/l to 29.6mg/l in tube well water and 6.67mg/l to 8.3mg/l in pond water. Total calcium is in the range of 131.57mg/l to 150.15mg/l for tap water, 146.69mg/l to 158.87mg/l for tube well water, 68.57mg/l to 72.45mg/l for pond water. The magnesium value ranges from 12.16mg/l to 12.83mg/l in tap water, 15.25mg/l to 15.86mg/l in tube well water, and 1.324mg/l to 2.84mg/l in pond water. The chlorine content is found in the range of 10.94mg/l to 14.67mg/l in tap water, 14.2mg/l to 16.046mg/l I tube well water, and 19.88mg/l to 24.57mg/l in pond water in the four studied areas. When the experimental values for the four studied areas are compared with Indian Standard (IS) Value recommended by WHO it is found that the pH value is below the WHO desirable limit (WHO minimum value is 6.5). Although WHO desirable limit for Indian standard is not fulfilled but the sample water fulfills the universal standard of

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

WHO for pH value (which is 5). The alkalinity, magnesium, calcium value for pond water also lies below the WHO standard but all values are almost near the standard range. In case of magnesium the difference is maximum 1.67mg/l. According to the instruction of WHO differences up to 7mg/l is considered to be safe value. The alkalinity value is slightly lower in pond water than that of tap and tube well water but it can be considered as safe as it fulfills closest position to the safe limit of pond water alkalinity value. The relation between the experimental values and WHO recognized values for Indian Standard for different parameters is compared graphically below excluding the chlorine value since there is no specification for chlorine limit.

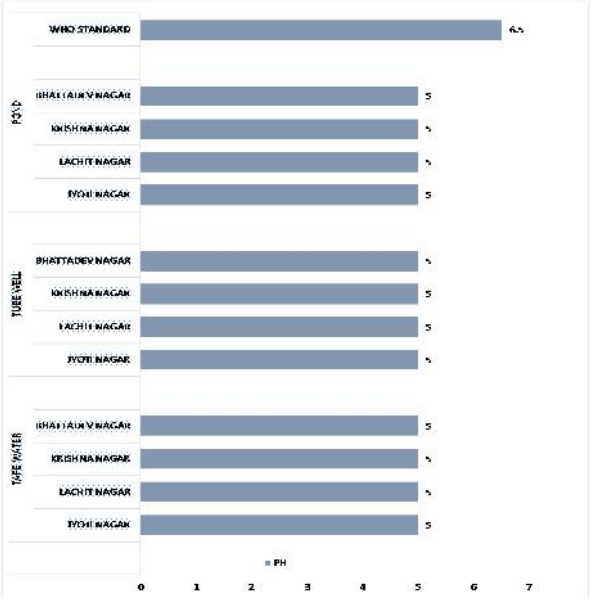

Fig 1: Comparison of WHO standard pH value with experimental pH values for the water samples in four studied area

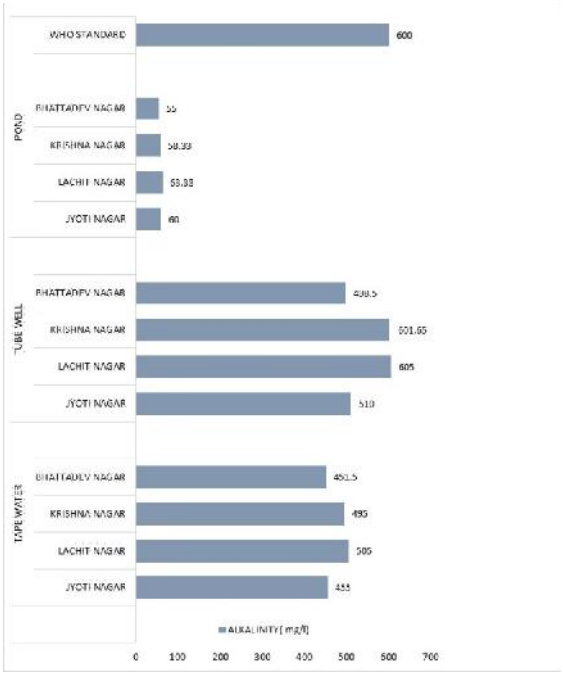

Fig 2: Comparison of WHO maximum permissible alkalinity (mg/l) value with experimental alkalinity (mg/l) values for the water samples in four studied area

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

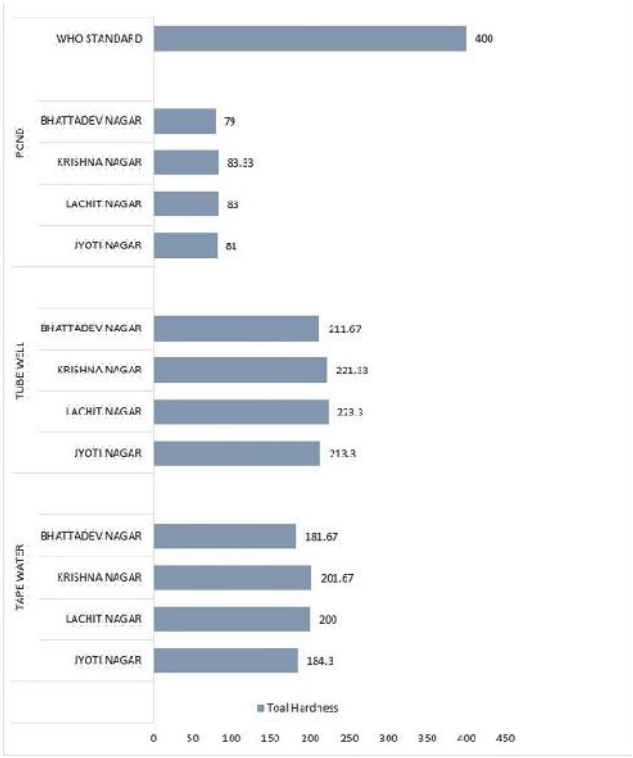

Fig 3: Comparison of WHO maximum permissible standard value for hardness (mg/l) with experimental hardness (mg/l) values for the water samples in four studied area

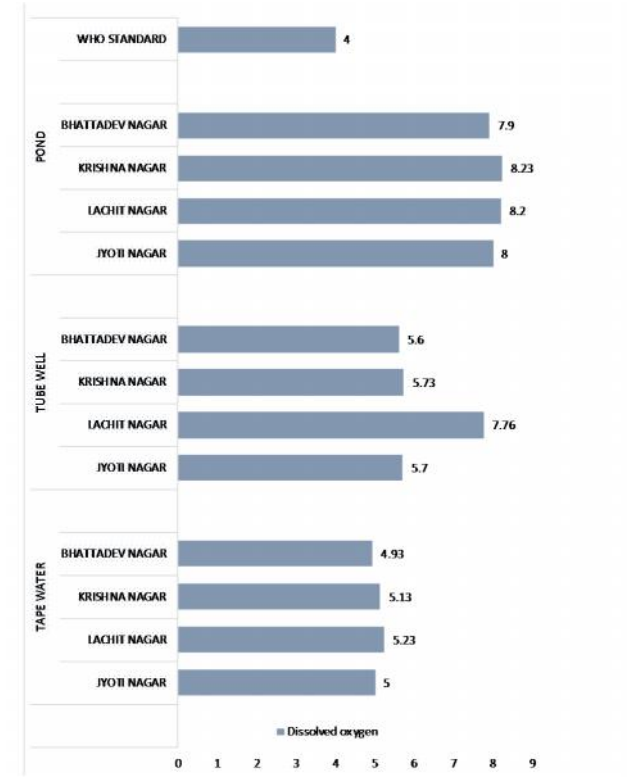

Fig 4: Comparison of WHO minimum permissible standard value for dissolved oxygen (mg/l) with experimental dissolved oxygen (mg/l) values for the water samples in four studied area

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

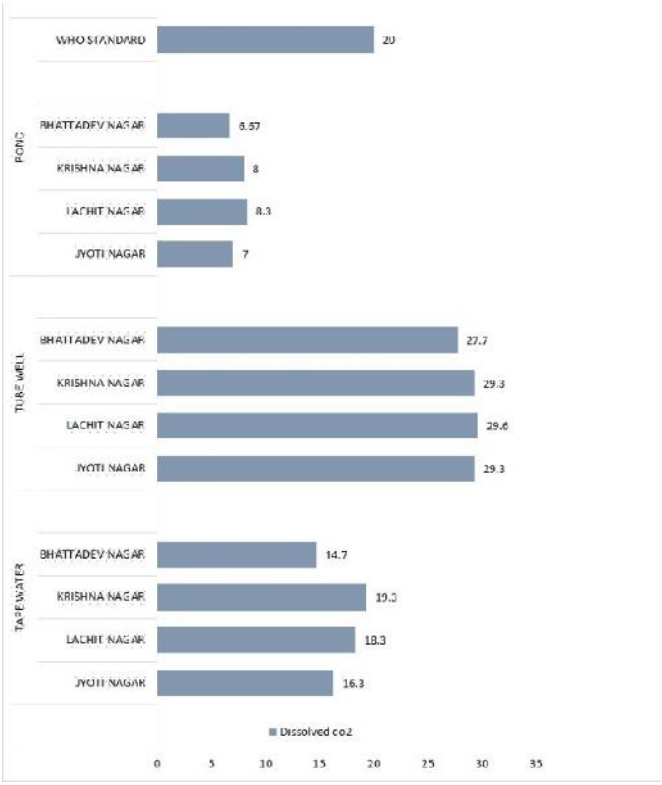

Fig 5: Comparison of WHO minimum permissible standard value for dissolved carbon-di-oxide (mg/l) with experimental dissolved carbon-di-oxide (mg/l) values for the water samples in four studied area

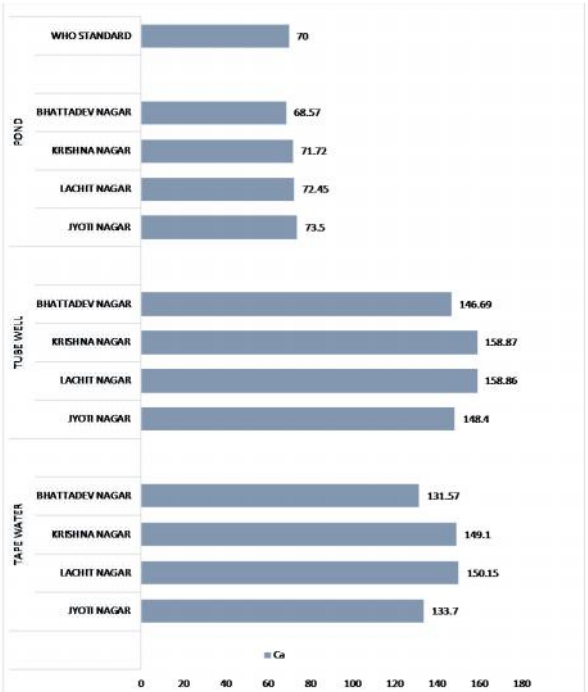

Fig 6: Comparison of WHO minimum permissible value for calcium (mg/l) with experimental calcium (mg/l) values for the water samples in four studied area

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

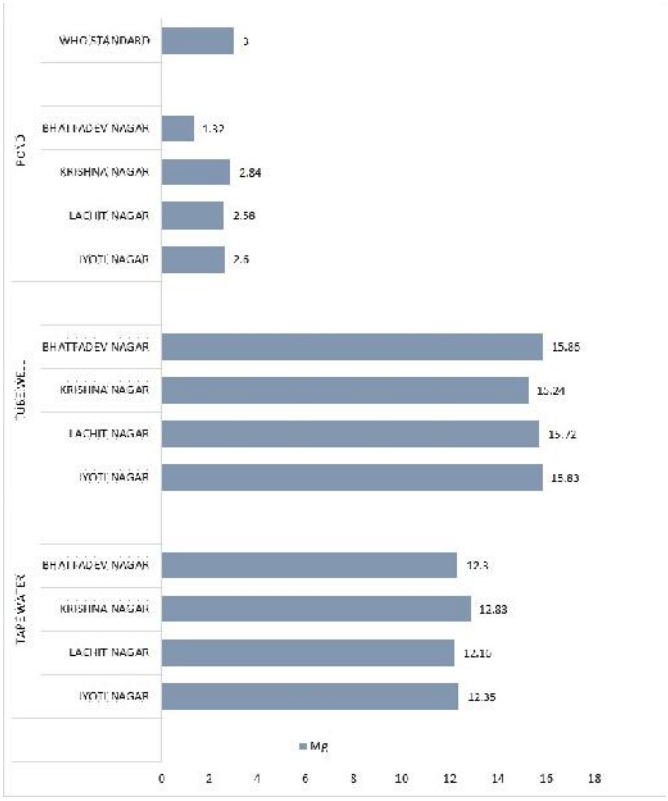

Fig 7: Comparison of WHO minimum permissible value for magnesium (mg/l) with experimental magnesium (mg/l) values for the water samples in four studied area

Experiments carried out to find out different parameters of sample water- untreated tap water, tube well water, and pond water collected from Jyotinagar, Lachitnagar, Krishnanagar and Bhattadevnagar are aimed for fulfillment of their status as per standards for safe water recommended by BIS (Bureau of Indian Standard) and WHO (World Health Organization). As all the water samples used for the present study are consumed by humans and animals the quality is an important object. The analyzing results for four studied areas show a remarkable good results by fulfilling the safe water parameter values for pH. The dissolved oxygen value is higher than minimum safe value 4.0mg/l in all the cases. In this study all the samples are within WHO maximum permissible limit for hardness 400mg/l. The safe alkalinity limit permitted by WHO as well as BIS is from 200mg/l to 600mg/l which is fulfilled by all the samples except pond water. But in case of pond water the difference is negligible and can be considered as safe. The magnesium and calcium values also satisfy either the safe value or near the value in all the cases. The chloride content of the samples do not exceed the safe BIS value of 250mg/l in any of the studied areas. Another important parameter dissolved carbon-di-oxide is also within or near the permissible limit of BIS.

To have a good result it is very important to compare it with the previous experiment results done in the same field. Safe drinking water value attains a good result in Barpeta district in fulfillment of WHO recommended value (5). Water analysis carried in Pathsala town and Bajali Block (tap and tube well water) is found to be free from almost all contamination and different parameters values are found under or near the WHO recommended safe drinking water value (6). Similarly while doing the present work all experimental values also satisfy IS safe drinking water values standardized by WHO occupying within the range or near the range. Annual report of drinking water quality in the year 2013 shows the safe position of Bajali area from one various point of contamination (7). The ground water quality assessment on some parts of Brahmaputra flood plain in Barpeta district with special focus on fluride, nitrate, sulphate and iron analysis in the year 2011 shows the fluride concentration within the WHO permissible limit. Similarly concentration of sulphate and nitrate are also within the approved WHO guideline values for safe drinking water. About 60% of the sampling locations are found

contaminated by iron as they exceed WHO guideline value of 0.3mg/l. But Bajali area is safe occupying the WHO standard value showing that the concentration of iron in this area is suitable for food processing, bleaching and many activities. Present work is not associated with the analysis of fluride, arsenic, iron, or other heavy metals but the different parameters –pH, alkalinity, hardness, dissolved oxygen, dissolved carbon-di-oxide, calcium, magnesium, chlorine does not exceed the WHO guideline values. All the values are within or near the WHO standard value for Indian standard.

CONCLUSION

The issue of access to potable water is very important in the developing countries. Water which is not safe to drink can cause diseases. Water which is contaminated can be treated to turn it into potable water by boiling as well as by treating with chemicals like bleach. Water can also be pumped through a filter to remove particulates. Potable water is defined in law by standards for a wide range of substances, organisms, and properties of water in regulation. The standards are set to be protective of public health. The issue of safe water is very important in all developing nations. Different Act and Rules have been standardized at national and international level to reach the safe standard value of water. “THE WATER PROTECTION (PREVENTION AND POLLUTION) ACT in 1974, “NATIONAL DRINKING WATER MISSION” in 1980, “RAJIV GANDHI NATIONAL DRINKING WATER MISSION” in 1991 are some important Acts which are working for improvement of potable water quality and to avoid all health problems caused due to water quality problems. Most of the programmes and Acts are aimed to maintain the standard quality value recommended by WHO. Potable water from different sources, to be said as safe, it must fulfill the requirement of WHO. In India, generally it must fulfill the Indian standard value for WHO (7) (8). Potable water quality is very important issues in today’s world. We all people should cooperate with government and non-government agencies to avoid all water quality problems, water born diseases, and to improve standard quality of drinking water.

REFERENCES

1. Perman, Roger., Ma, Yue., McGilvray, James., Common, Michael., 1996. ‘Natural Resource and Environmental Ethics’, first edition.
2. Ministry of drinking water and sanitation Government in India, updated 2013. ‘National Rural Drinking Water Programme, Rajiv Gandhi Drinking Water Mission, Movement towards ensuring people’s drinking water security in Rural India, framework for implementation’.
3. Flinn Scientific, Inc.,2017. ‘The Winkler Titration’.
4. Theraux, Frank.R., Eldridge, Edward.F., Mallamann, W. LeRoy. ‘Laboratory Manual of Chemical and Bacterial analysis of water and sewage’.
5. Results framework document for water department, 2012-13. ‘Ground Water Analysis’, Government of Assam.
6. Haloi, Nabanita., Sarma, H.P., 2011. ‘Ground water quality assessment of some parts of Brahmaputra flood plain in Barpeta district, Assam, with special focus on fluride, nitrate, sulphate, and iron analysis’. ‘International Journal of chemtech research’, volume-3.
7. WHO/SDE/WSH/03.04/16. ‘Total dissolved solids in drinking water, background document for development of WHO guidelines for drinking water quality’, second edition, volume2.
8. WHO, 1996. ‘Water, health criteria and other supporting information’.