

CHEMICAL AND PHYSICAL PARAMETERS AS INDICATORS OF DRINKING WATER QUALITY IN SACHET AND BOTTLED WATER IN AGO-IWOYE AND ITS ENVIRONS, SOUTHWESTERN NIGERIA.

Babatunde R.A., Olowofila I.O. and Bolanle Y.I.

Department of Science Laboratory Technology, The Federal Polytechnic Ilaro, Ogun State
Nigeria

Email: tunderasaq.ab@gmail.com

ABSTRACT:

Sixteen (16) samples of sachet water with eight (8) nomenclatures were taken, four samples of bottled water were also taken from four different manufacturers, representing the most highly consumed drinking water in Ago-Iwoye and its environs. The samples were examined for physical and chemical parameters such as pH, conductivity, turbidity, Na, K, Fe, Zn, Mg, ammonia and nitrate. The analysis showed that the pH at 25°C ranged from 5.53 to 8.25 for sachet water while it ranged from 6.24 to 7.99 for bottled water. The conductivity ($\mu\text{s}/\text{cm}$) ranged from 15.8 to 220 for sachet water but ranged 20 to 200 for bottled water. Turbidity (FTU) range was 0 to 3 for sachet water while it ranged 1 to 3 for bottled water, total dissolved solid (mg/l) ranged from 10 to 110 and from 10 to 140, total hardness (mg/l) ranged between 28 to 53 and between 7 to 49 for the sachet and bottled water respectively. Bicarbonate (mg/l) ranged from 2 to 6 for sachet water and while it ranged from 12 to 84 for bottled water. Nitrate (mg/l) was found to range between <1.0 to 10.2 for sachet water and between 1.1 and 3.0 for bottled water. Sulphate (mg/l) ranged from 0 to 9.01 for sachet water and 0 to 4.9 for bottled water, phosphate (mg/l) was between <0.05 to 0.17 and 0.04 to 0.20 for sachet and bottled water respectively, Magnesium (mg/l) ranged from 0.57 to 15.55 and from 0.69 to 10.58 for sachet and bottled water respectively, Iron (mg/l) was found to range from 0.01 to 0.05 and 0.01 to 0.07 in sachet and bottled water respectively. Alkalinity (CaCO_3) (mg/l) ranged from 2.0 to 6.0 and from 12.0 and 84.0 in sachet and bottled water respectively. These results water showed that the sachet water samples were harder than the bottled water samples. The results were compared with WHO standard limit for drinking water and recommendations were made.

KEYWORDS: Physical, Chemical Sachet and Bottled Water

1.0 INTRODUCTION

1.1 BACKGROUND OF STUDY

It is universally proven fact that water plays an important role in the existence of a man. Water is an indispensable commodity utilized in the day to day activities of human being. It is one of man's most precious resources and is generally taken for granted its uses are threatened by reduced availability or quality.

The demand for water in Ago-Iwoye and its environment has increased tremendously in recent years. This as a result of increasing in the number of students enrolment in the university situated at the centre of town.

Since, there is no pipe-borne water in Ago-Iwoye, although there is generally abundant water supply in the utilized well, especially during the raining season, there is nonetheless acute scarcity of safe or portable water.

However, the search for drinking water and water for domestic purpose has led to all corners

Production of what is now called packaged water. Packaged water is any water that is manufactured, distributed and offered for sale which is sealed in food grade containers, cellophane, plastic bottles or other materials and is intended for human consumption (Ogamba 2004)

1.2 THE STUDY AREA

Ago -Iwoye is in Ijebu North Local Government area of Ogun State, South Western Nigeria with latitude $6^{\circ}54'54''N$ and longitude $3^{\circ}51'30''E$. And it is located within the basement complex of South Western Nigeria.

2.1 SAMPLING

Sixteen (16) samples of sachets water with eight nomenclatures were bought; also four samples of bottled water were also bought from different manufacturers representing the most highly consumed drinking water in the whole of Ago-Iwoye and its environs. All the samples taken have NAFDAC registration number and the entire samples were taken to laboratory for analysis

2.2 RECONNAISSANCE SURVEY

To have full information of the study area, the reconnaissance survey of the area was first done before the actual analysis. The survey was aimed to know the environmental condition and method being used for the water purification by these manufacturers.

2.3 METHODOLOGY

The samples of water were taken to the laboratory and analyzed for physical parameters which include pH, TDS, conductivity, turbidity, appearance as well as chemical parameters which include total hardness (CaCO_3), alkalinity, iron, fluoride, nitrate (NO_3), chloride, sulphate, phosphate, calcium, sodium, potassium, magnesium, and nitrate.

2.4 CHEMICAL TEST USING AQUANOVA SPECTROMETERY METHOD

The incident light of light sources passed through the sample in the samples cell of 25ml which has already contain the indicator of the test parameters and part of the incident light is absorbed by the sample which equivalent to the amount of the test parameters contain in the sample. This displayed in mg/l on the spectrophotometer screen and the chemical parameters were analyzed.

2.5 PHYSICAL TEST USING THE INSTRUMENTATION FOLLOWS

- Jenway (pH meter) was used to measure pH values
- Conductivity meter was used to measure conductivity ($\mu\text{s}/\text{cm}$)
- Total Dissolve solid (TDS) meter was used to measure Total Dissolve solids (TDS) mg/l

3.1 RESULTS AND DISCUSSION

The results of physical and chemical parameters of sachet and bottle waters are reflected in table 1 and 2 respectively and they were in comparison with WHO standard limit for drinking water.

TABLE 1 Results of Physico-Chemical Parameters of Sachet Water with WHO Limit

PARAMETERS	WHO limit	SAMPLES							
		Baaju	Bolaks	Sb one	Alawful	Mae	Kay Bee	Takao	Bukrot
pH	6.5-8.5	8.25	5.73	5.76	7.61	7.46	5.53	7.39	7.49
Conductivity($\mu\text{s}/\text{cm}$)	1400	15.80	34.40	161.80	30.00	20.00	118.30	16.20	20.00
Total Hardness (mg/l)	300	30	28	64	38	6	53	33	32
Total Dissolve Solid (mg/l)	500	10	20	110	20	10	80	10	10
Iron (mg/l)	0.3	0.04	0.04	0.04	0.01	0.04	0.05	0.03	0.01
Fluoride (mg/l)	0.65	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nitrate (mg/l)	10.0	< 1.0	2.1	10.20	0.9	1.4	6.9	< 1.0	< 1.0
Chloride(mg/l)	70.00	2.70	3.60	9.50	2.50	3.70	7.30	1.70	1.60
Phosphate (mg/l)	0.65	0.05	0.15	0.05	0.05	0.17	0.03	0.04	0.07
Sulphate (mg/l)	400	5.8	6.1	9.01	3.2	3.0	4.8	4.1	3.7
Calcium (mg/l)	70	3.2	1.6	9.62	5.61	1.6	9.62	4.01	3.2
Sodium (mg/l)	200	1.75	3.75	15.75	2.50	0.57	12.50	2.25	1.75
Potassium (mg/l)	NA	0.85	0.50	4.95	0.78	0.76	0.83	0.83	0.85
Magnesium(mg/l)	30	7.66	7.55	15.55	9.26	13.35	12.41	8.29	8.24

The comparison showed that most of all parameters analyzed for all the samples were within the WHO limit for drinking water except that the pH of SBone, Bolak and Kay Bee in sachet samples are slightly acidic. The reason for the deviation from the standard pH value could be attributed to the sources of water. Also SBone has nitrate concentration of 10.2mg/l which was a little higher

than the WHO limit. This implies that consumption of such water by infants, directly or in formular preparation can lead to blue baby syndrome due to conversion of the nitrate to nitrite.

TABLE 2. Results of Physic-Chemical Parameters of Bottled with WHO Limit

PARAMETERS	WHO limit	SAMPLES			
		Blessed	Eva	Gossy	Cascade
pH	6.5-8.5	6.54	7.47	7.99	7.58
Conductivity(μ s/cm)	1400	40	200	20	220
Total Hardness (mg/l)	300	13	46	14	84
Total Dissolve Solid (mg/l)	500	30	150	10	140
Iron (mg/l)	0.3	0.05	0.02	0.07	0.01
Fluoride (mg/l)	0.65	<0.02	<0.02	<0.02	< 0.02
Nitrate (mg/l)	10.0	2.4	1.1	1.2	3.0
Chloride(mg/l)	70.00	2.52	2.50	2.54	1.70
Phosphate (mg/l)	0.65	0.04	0.06	0.20	0.05
Sulphate (mg/l)	400	2	4.9	3	0
Calcium (mg/l)	70	3.21	12.02	1.62	3.81
Sodium (mg/l)	200	0.54	0.87	0.67	1.08
Potassium (mg/l)	NA	0.45	0.34	0.52	0.38
Magnesium(mg/l)	30	1.52	10.58	0.81	0.69

3.2 JUSTIFICATION BETWEEN SACHET AND BOTTLED SAMPLES

Table 3 showed the comparison of the result of parameters between sachet and bottled samples and it showed that some sachet samples of water have lower pH value than the bottled water in comparison with WHO standard. This implies that the bottled water samples analysed were a little better than the sachets.

TABLE 3. Showing Comparison between Sachet and Bottled Samples

PARAMETERS	WHO limit	SAMPLES	
		SACHET	BOTTLED
pH	6.5-8.5	5.53-8.25	6.54-7.99
Conductivity(μ s/cm)	1400	15.58-220	20-200
Total Hardness (mg/l)	300	6-64	13-84
Total Dissolve Solid (mg/l)	500	10-110	10-140
Iron (mg/l)	0.3	0.01-0.05	0.01-0.072
Fluoride (mg/l)	0.65	≤ 0.02	≤ 0.02
Nitrate (mg/l)	10.0	< 1	1.1-3.00
Chloride(mg/l)	70.00	- 10.2	< 1.0
Phosphate (mg/l)	0.65	0.05-0.17	- 10.2
			0.04-0.20

Sulphate (mg/l)	400	0-9.01	0-4.9
Calcium (mg/l)	70	3.21-12.02	1.60-9.62
Sodium (mg/l)	200	0.54-1.08	0.57-15.75
Potassium (mg/l)	NA	0.34-0.52	0.50-4.95
Magnesium(mg/l)	30	0.57-15.55	0.69-10.58

3.3 CONCLUSION

The analysis showed that all the samples are safe for drinking although the bottled ones are little better. The study like this should be carried out periodically, say at interval of every two years to currently update the quality of packaged water consumed by the society and to gain a proper insight into the extent of solvent action of water on human health.

REFERENCES

American Public Health Association (1998). Standard method examination of water and water waste, Washington D.C

Oke R.A (2002). Characterization of sub-surface geology of Ago-Iwoye for ground water abstraction. Unpublished Bsc dissertation in the department of Geology, Olabisi Onabanjo University, Ago-Iwoye. 4-9

Okubanjo O. O (1998). Physical and chemical properties of ground water in Ago Iwoye unpublished BSC dissertation in the Department of Physics Olabisi Onabanjo University Ago Iwoye. 10-1

Oyawoye M.O (1998). The geology of Nigeria basement complex, journal of min. Geo. Metallic society. 132

World Health Organisation (2004). Guidelines for drinking, Geneva, World Health Organization