

STANDARD EVALUATION OF SACHET WATER IN YOBE NORTH EASTERN NIGERIA

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Abstract: *The investigation X-rayed the physio-chemical and bacteriological quality of water samples produced and marketed in Yobe state. Five samples each from different manufactures of sachet water were randomly purchased from sellers within Potiskum metropolis. The samples were analyzed for their physio-chemical and bacteriological parameters. The analytical results were compared with the WHO permissible values. It was observed that the colour of each water samples were found to be 5.02/5.01 Hazen units which is exactly the same as the standard value; so the water is not polluted by colour. The appearance and odour of the water were found acceptable quality for drinking water as compared with the WHO standard. The observed temperatures of the water were fairly above the standard value of 29.4⁰C.*

All the water samples are fit for consumption only if the concentration of ammonium nitrite, nitrate, conductivity and the bacteriological quality of the water are improved.

Key Words: *Physio-chemical analysis, Bacteriological analysis, Sachet water, Potiskum.*

1. INTRODUCTION:

The production, distribution and consumption of sachet water in most part of Nigeria are on the increase. This is due to the high demand for quality water for human and animal consumption. Water quality refers to its fitness for the different purposes in which the water can be put to use. It also refers to those chemical, physical or biological characteristics by which the user evaluates the acceptability of the water. This implies that the use of water for drinking purposes should be given adequate attention because this may directly affects the health and wellbeing of human beings as pointed out by Ekon, and Eddy(2005).

2. MATERIALS AND METHODS:

Five samples each from different producers were randomly purchased from sellers from some streets within Potiskum municipality.

The colour and physical appearance of the water, odour, temperature, turbidity, electrical conductivity and pH were determined by using approved and recommended methods. The concentration of iron and calcium, potassium and sodium were determined by using approved instrumental methods. The chloride content of the water was determined by titrating with 0.012M AgNO₃. The concentration of nitrate, ammonia and nitrite in the water sample was determined by colorimeter. The total hardness of the water was determined by EDTA titration. The dissolved oxygen content of the water was determined by titrating 0.05M NaOH. The total dissolved solid content of the water was determined by using HACH meter model 3305 while the bacteriological analysis of the water was done by the method reported by Ugwu (2016).

3. RESULT AND DISCUSSION:

The result of the analysis is presented in table 1 as shown above. The colours of all the water samples were found to be 5.01/5.01 Hazen units. Which is the same as the standard value; hence the water is not polluted with by colour. The appearance and the odour of the water were acceptable quality as compared with the requirement expected for standard. The observed temperatures of the water were fairly above the standard value of 29.4⁰C. The mean iron content of all the samples was 0.02mg/L which is within the permissible iron content (0.3mg/L.) for drinking water. Hence, the samples are not polluted with respect to iron. The mean electrical conductivity of sample A (168.80) and E (173.00) exceeded the standard value of 75mS/em given by WHO. This suggests that the water samples are polluted with respect to conductivity. The observed high conductivities of sample A and E suggest that these samples contain excessive amount of electrolyte such as chloride and CaCO₃. However, the chloride content of samples A (6.20mg/L) and E (6.10mg/L) did not exceed the maximum tolerance limit of 100mg/L required for drinking water. These samples B and E were observed to be moderately soft as compared to other samples, which are soft. This suggests that the high

conductivity of the water might have been partly contributed by the concentration of CaCO_3 and other electrolytes present in the water. In almost water, electrolytes are present in the form of soluble metallic salts (such as NO_3 , NO_2 , Cl). In this investigation, the concentration of nitrate and nitrite is lower than expected. It can be stated that all the water samples are polluted with respect to nitrate.

The alkalinity of the water samples was significantly at below level, its permissible and desirable criteria for domestic water supply. The observed alkalinity was because of methyl orange alkalinity, phenolphthalein were zero in all the water samples. Hence, the water samples are not polluted with respect to alkalinity also. The concentration of dissolved oxygen, chloride, potassium, TDS, sodium, CO_2 , and turbidity of the water were also below the permissible criteria for drinking water.

Table 1: Mean of physical and chemical parameters in sachet water

Parameters	A	B	C	D	E	WHO
Appearance	ND	ND	ND	ND	ND	-
Colour(Hazen Unit)	5.02	5.01	5.01	5.02	5.01	5
Odour	ND	ND	ND	ND	ND	NIL
Temperature ($^{\circ}\text{C}$)	29.50	29.60	29.50	29.50	29.60	29.4
Total ion (mg/l)	0.02	0.02	0.20	0.02	0.02	0.3
pH	0.32	8.40	7.60	5.80	7.30	6-8.5
turbidity (NTU)	68.80	0.41	0.36	0.23	0.30	1
conductivity	168.80	69.90	68.30	60.41	173.00	75
sodium (mg/l)	8.00	2.00	2.00	10.00	15.00	200
Potassium(mg/l)	0.20	0.50	0.20	0.20	0.10	-
Total alkalinity (mg/l)	1.00	1.00	2.00	1.00	2.00	30-50
Phen alkalinity (mg/l)	0.00	0.00	0.00	0.00	0.00	-
Methyl orange alkalinity	1.00	1.00	2.00	6.10	2.00	-
Chloride (mg/l)	0.00	7.00	5.50	97.00	6.20	30-500
Total hardness (mg/l)	6.20	33.00	48.00	0.14	6.10	600
DO (mg/l)	0.10	0.10	86	0.57	97	100
CO_2 (mg/l)	1.00	0.50	0.50	0.12	0.10	4
Nitrate (mg/l)	0.10	0.13	0.18	0.10	0.50	-
TDS (mg/l)	0.12	0.20	0.10	0.12	0.19	10
Nitrite (mg/l)	37.20	98.20	0.20	65.00	0.11	500
	0.01	0.03	0.02	0.01	0.03	1.0

Table 2: Result of bacteriological analysis of the water samples

Sample	E-coli	Foecal streptococci	Clostridium perfringens	Total coliforms
A	16	24	6	368
B	8	10	2	192
C	16	7	3	176
D	4	5	1	23
E	5	7	2	120

The bacteria species isolated from the water samples were E-coli, faecalstreptococci, clostridium perfringens and total coliform. The population of these bacteria is presented in the table above. It is worthy of note that E-coli and coliform bacteria should not be present in drinking water as pointed out by Ekon and Eddy (2005). From the results, sample D has the lowest coliform counts (MPN/100mL) of 23 while sample A has the highest (368). The value for sample D(23) is below the standard of 3 MPN/mL for coliform in drinking water as asserted by Amoo, I.A and Akinbode,A.M(2007)

4. CONCLUSION:

The study shows that the conductivities of sample A and E were above the World Health Organization standard. While the concentrations of Nitrate and nitrate in all water samples were below the permissible criteria for drinking water. The presence of undesirable bacteria in the water was also confirmed by characterization study. The bacteriological quality of all the water samples was therefore unsatisfactory for human consumption. Other analytical parameters were within the acceptable limit. It therefore follows that the major problem facing the sachet water manufactured in Yobe State is the adoption of purification system and also terminate microbial population in the

water. Consequently, the producers of package water should embark on routine chemical and microbial analysis before the water is packed and distributed to end-users. Adoption of modified production methods and the use of control chart should be properly implemented. It is highly necessary that all the companies engaged in the business of water production and purification should have a standard laboratory in order to aid routine sample analysis.

REFERENCES:

1. Amoo, I.A and Akinbode,A.M(2007). Physiochemical analysis of well water in and Hall London.Bitter and Tanner press, London.
2. Chapman, D. (1996) Water quality assessment. A guide to the use of Biota-content of sediment in Obhulu River in Edo State. Integrated Research Journal, 2(1):234-239.
3. Ekairia, J.O (2013) . Physiochemical parameters of water and heavy metals in River Obhulu in Edo State, Nigria.
4. Ekon, A.S and Eddy, N.O(2005). Assessment of the quality of sachet and bottled water in Akwa Ibom State South Eastern Nigeria. Proceedings of the 28th Annual Intl Conference of the Chemical Society of Nigeria, organized in Maiduguri, 7th-11th September.
5. Ugwu (2016). Biological aspects of water pollution. 6nd ed. Mc publishers, SA.