Physico-chemical Properties of Pure Water Samples in South Western Nigeria

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Abstract

Pure water samples were evaluated for their physicochemical properties. Samples 5 gave higher values of K(15 ppm), mg(6.75 ppm) and Zn (0.04 ppm). While sample 6 was high in P (4.85 ppm). The pH value of samples 8 (7.65) was also higher. Biochemical Oxygen Demand (B.O.D), Chemical Oxygen Demand (COD) and Total Suspended Matter were not detected in all the samples. However the total dissolved solids of sample 3 (0.012%) was very low. The colour of samples 1, 2, 4, 5, 7 and 8 are not significantly different from each other, while samples 3 and 6 are significantly different from each other. The taste of samples 2 and 5 were objectionable while the odours of samples (2-8) were objectionable. It is apparent from this study that the quality of the pure water samples could improve if a better water treatment is adopted.

Key words: Pure water, physicochemical and treatment

Introduction

Water, our most widespread natural resource, may be regarded as the second most important necessity of man (Encyclopaedia 1964 and Baptist, 1980). Water is frequently used for drinking, as cooling agent, for sterilising and pasteurising processes and for diverse metabolic processes in plants and animals (Fakunle *et al* 1980).

Over the last few years, there has been epileptic supply of water in Ibadan environ of South Western Nigeria. On few occasions where there is water supply from the government water treatment plants, the water is usually of poor quality. This trend has led to the introduction of water packaged in small polyethylene bags called Pure Water.

Pure Water is generally known to be cheap and readily available. Also pure water samples from production sites are tested initially by NAFDAC (National Agency for Food and Drug Administration and Control) to ascertain their wholesomeness before these products are sent out for sales. But overtime there has been complaint by consumers about the quality of these pure water samples vis-a-vis presence of particles cum off odour and taste. There is also no public detailed information on their physicochemical properties since most of these companies do not print it on their packages. This information is very important in ascertaining the quality attributes of these samples, especially for foreigners visiting the southern part of the country for the first time and it also helps in food formulation and nutritional studies.

Hence this research work is aimed at evaluating the physicochemical properties of some popular pure water samples sold in Ibadan, the most populous town in South Western Nigeria.

Materials and methods

Pure Water samples were collected from four local government areas of Ibadan namely Iddo, South West, Northwest and Egbeda.

Physical characteristics

Odour and taste were determined using (Baker-Robert 1963) while colour was by (APHA *et al* 1967). Total dissolved solids and total suspended matter were by (Helmer, 1988).

Chemical analysis

pH was determined using a glass electrode after standardising with pH 7 buffer solution (APHA *et al* 1967). Mineral elements were determined using (AOAC, 1980) methods. While biochemical and chemical oxygen demand were by (APHA *et al* 1967).

Statistical analysis

Data obtained were subjected to analysis of variance test and the means were separated by Duncan Multiple range test (Duncan 1955) to establish the differences between the means.

Results and Discussion

Physical properties of pure water samples

It can be observed from the physical properties of pure water samples (**Table 1**) that the colour of samples 6 was significantly different from other samples at $p<0.05$. The odour of sample 1 was unobjectionable while samples (2-8) are objectionable. The taste of samples 2 and 5 are objectionable while the other samples are unobjectionable. The total dissolved solids of all the pure water samples are generally very low with sample 1 being significantly different from other pure water samples at $p<0.05$. There was no total suspended matter in all the samples.

Table 1 Physical properties of pure water samples

Sample	Colour	Odour	Taste	Total dissolved solids (%)	Total suspended matter (mg/l)
1	5^b	Unobjectionable	Unobjectionable	0.051^a	NIL
2	5^b	Objectionable	Objectionable	0.034^d	NIL
3	4^c	Objectionable	Unobjectionable	0.012^h	NIL
4	5^b	Objectionable	Unobjectionable	0.018^g	NIL
5	5^b	Objectionable	Objectionable	0.028^e	NIL
6	6^a	Objectionable	Unobjectionable	0.044^b	NIL
7	5^b	Objectionable	Unobjectionable	0.037^c	NIL
8	5^b	Objectionable	Unobjectionable	0.026^f	NIL

Means in same column followed by the same letter are not significantly different ($p<0.05$)

Table 2. Chemical composition of Pure Water samples

Samples	pH	Ca (ppm)	Na (ppm)	K (ppm)	Mg (ppm)	Zn (ppm)	P (ppm)	BOD (mg/l)	COD (mg/l)
1	7.45^{d}	1.0^{h}	4.80^{g}	2.10^{g}	1.75^{g}	Nil	2.14^{d}	Nil	Nil
2	7.50^{c}	4.95^{f}	15.0^{d}	5.70^{e}	4.0^{b}	0.01^{b}	4.19^{b}	Nil	Nil
3	7.20^{g}	18.10^{a}	9.50^{f}	4.50^{f}	2.50^{c}	Nil	1.21^{f}	Nil	Nil
4	7.30^{f}	6.05^{d}	16.0^{c}	1.10^{h}	1.00^{g}	0.04^{a}	1.86^{e}	Nil	Nil
5	7.20^{g}	12.05^{d}	14.0^{e}	15.0^{a}	6.75^{a}	0.04^{a}	3.08^{c}	Nil	Nil
6	7.35^{e}	4.05^{g}	24.0^{a}	7.80^{b}	1.70^{e}	0.01^{b}	4.85^{a}	Nil	Nil
7	7.60^{b}	7.0^{d}	15.0^{d}	6.30^{c}	1.60^{f}	Nil	1.21^{f}	Nil	Nil
8	7.65^{a}	8.0^{c}	19.0^{d}	5.90^{d}	0.50^{h}	0.01^{b}	0.19^{g}	Nil	Nil

Means in the same column followed by the same letter are not significantly different ($p<0.05$

Chemical composition of pure water samples

For chemical composition (**Table 2**) it was observed that the pH of sample 8 was significantly different from other samples at $p<0.05$. However samples 5 and 3 were least with pH value of (7.20). These differences could be due to the presence of bicarbonates and carbonate compounds (APHA *et al* 1967); Sample 5 was also significantly different from other samples at $p<0.05$ having K (15.0ppm) and Mg (6.75 ppm). The Zinc of samples 4 and 5 are not significantly different from each other. It shows that sample 5 is rich in the highlighted minerals. Sample 6 was also significantly different from other samples with regard to phosphorous. Biochemical Oxygen Demand and Chemical Oxygen Demand were not detected in all the samples. The absence of these indicates that the water samples could be free from aerobic micro-organisms and are therefore not polluted (Ashaye, 1988 and APHA *et al* 1967).

Conclusion

It can be concluded that the quality of the pure water samples can improve if a better water treatment is adopted.

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