

Proximate Assessment of Physicochemical and Microbial Parameter of Five Different Bottled Water in Kano

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Abstract: The study sampled five bottled water consumed in Kano which include Sona, Santana, Aquafina, Eva and Swan bottled water (popularly consumed in eateries, suya spots, garage among others in kano). Analysis was done using standard method and results obtained for the physicochemical and microbial assay was below the guidelines limit of WHO, indicating the suitability of the bottled water analyzed for the aforementioned parameters. Hence, the populist believed bottled water is safe for consumption; thorough monitoring survey is needed to enhance the quality and safety sustenance.

Keywords: Microbial, physicochemical, assay.

INTRODUCTION

Water is the most common liquid on our planet earth, vital to life form. The total water on earth is enormous, which is 1.5×10^{18} metric tons, this quantity is 300 times larger than the mass of the entire atmosphere (Abaje, *et al.*, 2009). Unfortunately, most of these are not accessible because they appear in ice-caps, oceans, in underground aquifers (ground water-bearing beds) and some are even in the air as moisture. Only a small fraction of water is on earth surface and directly accessible to man as rivers, streams and springs (Jimoh and Aminu, 2011). Out of the small fractions available to man for consumption, extra treatment is needed to purify its quality for safe consumption and to ensure its

continually safety through monitoring survey. This work is done to ascertain the suitability or fitness for consumption of five bottled water procured in Kano state.

Aim of the study:

This research is aimed at evaluating the comparative analysis of physicochemical and microbiological properties of 5 various bottled water produced in Kano.

Description of Sampling Site:

Kano state is in the northern part of Nigeria, it's a commercial and industrial hub in West Africa sub region. Below is Nigeria map showing kano state.

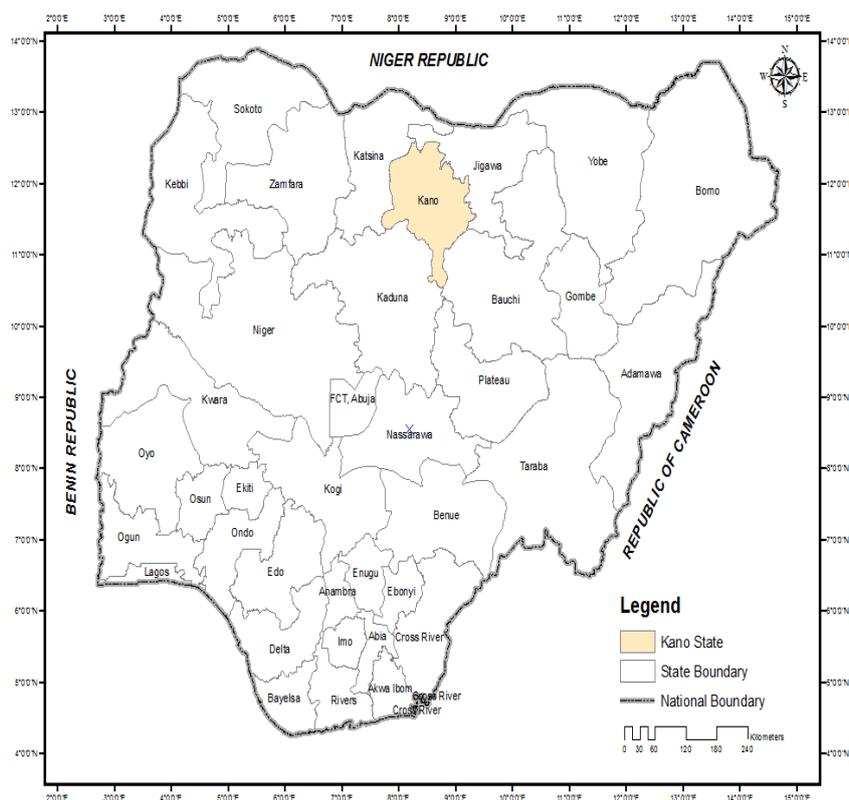
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MATERIAL AND METHODS

Analysis Of The Physicochemical And Microbial Parameters Of The 5 Different Bottled Water In Kano is done by randomly procuring or purchasing a pack (containing twelve bottles) of bottled water produced on Monday, opening six out of it, mixing it together and collecting a composite sample of one litre each, making it a total of five samples per session (it is done similarly on Wednesday and Friday to cumulatively obtain fifteen samples), in situ analysis is done for taste, turbidity, pH, colour, odour and conductivity. Ex situ assay was done for others using standard method as recommended by America Public Health Agency (APHA) (Bamishaye, *et al.*, 2011). This

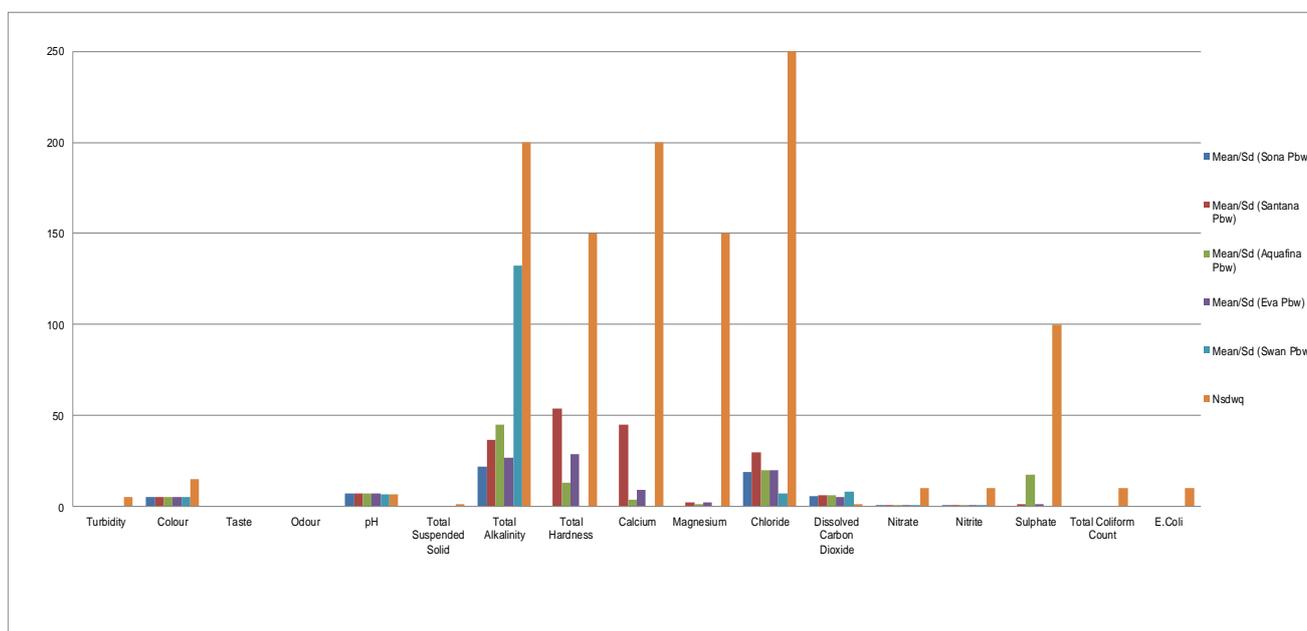
various plastic bottled water samples previously labeled in sample bottle and vials were taken to TAMBARAWA WATER WORKS, Kano State for physicochemical and microbial analysis.

RESULTS AND DISCUSSION

Result of the various plastic bottled water samples analyzed is presented below in table 1. **TABLE 1:** Show the parameters, analytical results, mean/standard deviation, maximum allowable concentration (NSDWQ) and remarks of SONA, SANTANA, AQUAFINA, EVA AND SWAN PLASTIC BOTTLED WATER.

SN	Parameters	Mean/Sd (Sona Pbw)	Mean/Sd (Santana Pbw)	Mean/Sd (Aquafina Pbw)	Mean/Sd (Eva Pbw)	Mean/Sd (Swan Pbw)	Nsdwq	Remark
	Turbidity	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	5.00NTU	Suitable
	Colour	5.00±0.0	5.00±0.0	5.00±0.0	5.00±0.0	5.00±0.0	15.0Hazen	Suitable
	Taste	Nil	Nil	Nil	Nil	Nil	ND	ND
	Odour	Nil	Nil	Nil	Nil	Nil	ND	ND
	pH	7.1±0.2	7.1±1.5	6.97±0.06	6.8±0.058	6.7±0.12	6.50-8.50	Suitable
	Total Suspended Solid	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	1.0 mg/L	Suitable
	Total Alkalinity	21.7±2.9	36.7±2.89	45±5	26.7±2.89	132±2.89	200mg/l	Suitable
	Total Hardness	0.00±0.0	53.8±0.0	13.00±0.0	28.4±5.18	0.00±0.0	150mg/l	Suitable

Calcium	0.00±0.0	44.89±0	3.60±0.0	9.01±1.8	0.00±0.0	200mg/l	Suitable
Magnesium	0.00±0.0	2.19±0.0	1.00±0.0	2.17±1.09	0.00±0.0	150mg/l	Suitable
Chloride	19.0±0.0	29.61±0	19.7±0.0	19.74±0.0	6.9±0.95	250mg/l	Suitable
Dissolved Carbon Dioxide	5.33±1.2	6.00±1.2	6.00±0.0	5.00±1.15	8.0±2	1.0 mg/l	Suitable
Nitrate	0.27±0.1	0.83±0.001	0.2±0.0	0.36±0.06	0.1±0.0	10 mg/l	Suitable
Nitrite	0.010±0.0	0.004±0.058	0.011±0.001	0.0026±0.06	0.002±0.0	10 mg/l	Suitable
Sulphate	0.00±0.0	1.00±0.0	17.3±1.15	1.00±0.0	0.00±0.0	100 mg/l	Suitable
Total Coliform Count	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	10cfu/100ml	Suitable
E.Coli	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0	10cfu/100ml	Suitable



The table and bar chart depicted above shows the peaks, mean/standard deviation values and names of the physicochemical/microbial pollutants detected for the five bottled water analyzed. SONA PLASTIC BOTTLED WATER samples examined had nineteen (19) possible pollutants (physicochemical/microbial parameter or property) identified, they are viz; turbidity (0.00±0.0); colour (5.00±0.0); taste (nil); odour (nil); pH (7.1±0.2); conductivity (4.26±0.13); total dissolve solid (2.0±0.53); total suspended solid (0.00±0.0); total alkalinity (21.7±2.9); total hardness (0.00±0.0); calcium (0.00±0.0); magnesium (0.00±0.0); chloride (19.0±0.0); dissolved carbon dioxide (5.33±1.2); nitrate (0.27±0.1); nitrite (0.010±0.0); sulphate (0.00±0.0); total coliform count (0.00±0.0) and E.Coli (0.00±0.0).

Turbidity is impacted into water through accumulation of particles that are insoluble. It is directly proportional to total suspended solid and total dissolved solid. Conductivity is the concentration of ion present in the water while pH is the degree of acidity. Alkalinity is due to carbonates and hydroxides of calcium, magnesium, potassium and sodium available in rock

formation, it is directly associated to hardness. The nitrate, sulphate and coliform presence in water is as a result of oxide of nitrogen and oxide of sulphate while coliform is microbial algae presence (Singh, & Mosely, 2003).

From the nineteen physicochemical and microbial properties examined for SONA PLASTIC BOTTLED WATER. The result obtained and revealed shows that all the parameters and properties analyzed were below the standard guideline limit of World Health Organization (2004) and Nigeria standard limit for drinking water (with the exception of taste and odour that is non- detected).

Based on the aforementioned findings and assertion from the result analyzed, SONA plastic bottled water is safe and suitable for drinking, when focused on the physicochemical and microbial parameters understudied. The table depicted above shows the peaks, mean/standard deviation values and names of the physicochemical/microbial pollutants detected in

SANTANA PLASTIC BOTTLED WATER sample analyzed. There are nineteen (19) possible pollutants (physicochemical/microbial parameter or property) identified, they are viz; turbidity (0.00±0.0); colour (5.00±0.0); taste (nil); odour (nil); pH (7.1±1.5); conductivity (87.0±0.06); total dissolve solid (43.2±0.25); total suspended solid (0.00±0.0); total alkalinity (36.7±28.9); total hardness (53.8±0.0); calcium (44.89±0.0); magnesium (2.19±0.0); chloride (29.61±0.0); dissolved carbon dioxide (6.00±1.2); nitrate (0.83±0.001); nitrite (0.004±0.058); sulphate (1.00±0.0); total coliform count (0.00±0.0) and E.Coli (0.00±0.0).

From the nineteen physicochemical and microbial properties examined for SANTANA PLASTIC BOTTLED WATER. The result obtained and revealed shows that all the parameters and properties analyzed were below the standard guideline limit of World Health Organization (2004) and Nigeria standard limit for drinking water (with the exception of taste and odour that is non- detected).

Based on the aforementioned findings and assertion from the result analyzed, SANTANA plastic bottled water is safe and suitable for drinking, when focused on the physicochemical and microbial parameters understudied.

From the table depicted, it shows the peaks, mean/standard deviation values and names of the physicochemical/microbial pollutants detected in AQUAFINA PLASTIC BOTTLED WATER sample analyzed. There are nineteen (19) possible pollutants (physicochemical/microbial parameter or property) identified, they are viz; turbidity (0.00±0.0); colour (5.00±0.0); taste (nil); odour (nil); pH (6.97±0.06); conductivity (106±2); total dissolve solid (51.8±0.00); total suspended solid (0.00±0.0); total alkalinity (45±5); total hardness (13.00±0.0); calcium (3.60±0.0); magnesium (1.00±0.0); chloride (19.7±0.0); dissolved carbon dioxide (6.00±0.0); nitrate (0.2±0.0); nitrite (0.011±0.001); sulphate (17.3±1.15); total coliform count (0.00±0.0) and E.Coli (0.00±0.0).

From the nineteen physicochemical and microbial properties examined for AQUAFINA PLASTIC BOTTLED WATER. The result obtained and revealed shows that all the parameters and properties analyzed were below the standard guideline limit of World Health Organization and Nigeria standard limit for drinking water (with the exception of taste and odour that is non- detected).

Based on the aforementioned findings and assertion from the result analyzed, AQUAFINA plastic bottled water is safe and suitable for drinking, when focused on the physicochemical and microbial parameters understudied.

From the table depicted, it shows the peaks, mean/standard deviation values and names of the physicochemical/microbial pollutants detected in EVA PLASTIC BOTTLED WATER sample analyzed. There are nineteen (19) possible pollutants (physicochemical/microbial parameter or property) identified, they are viz; turbidity (0.00±0.0); colour (5.00±0.0); taste (nil); odour (nil); pH (6.8±0.058); conductivity (87.1±0.058); total dissolve solid (41.1±0.058); total suspended solid (0.00±0.0); total alkalinity (26.7±2.89); total hardness (28.4±5.18); calcium (9.01±1.8); magnesium (2.17±1.09); chloride (19.74±0.0); dissolved carbon dioxide (5.00±1.15); nitrate (0.36±0.06); nitrite (0.026±0.06); sulphate (1.00±0.0); total coliform count (0.00±0.0) and E.Coli (0.00±0.0).

From the nineteen physicochemical and microbial properties examined for EVA PLASTIC BOTTLED WATER. The result obtained and revealed shows that all the parameters and properties analyzed were below the standard guideline limit of world health organization and Nigeria standard limit for drinking water (with the exception of taste and odour that is non- detected).

Based on the aforementioned findings and assertion from the result analyzed, EVA plastic bottled water is safe and suitable for drinking, when focused on the physicochemical and microbial parameters understudied.

From the table depicted, it shows the peaks, mean/standard deviation values and names of the physicochemical/microbial pollutants detected in SWAN PLASTIC BOTTLED WATER sample analyzed. There are nineteen (19) possible pollutants (physicochemical/microbial parameter or property) identified, they are viz; turbidity (0.00±0.0); colour (5.00±0.0); taste (nil); odour (nil); pH (6.7±0.12); conductivity (126±0.0); total dissolve solid (59.1±0.058); total suspended solid (0.00±0.0); total alkalinity (132±2.89); total hardness (0.00±0.0); calcium (0.00±0.0); magnesium (0.00±0.0); chloride (6.9±0.95); dissolved carbon dioxide (8.2±2); nitrate (0.1±0.0); nitrite (0.002±0.0); sulphate (0.00±0.0); total coliform count (0.00±0.0) and E.Coli (0.00±0.0).

Turbidity is impacted into water through accumulation of particles that are insoluble. It is directly proportional to total suspended solid and total dissolved solid. Conductivity is the concentration of ion present in the water while pH is the degree of acidity. Alkalinity is due to carbonates and hydroxides of calcium, magnesium, potassium and sodium available in rock formation, it is directly associated to hardness. The nitrate, sulphate and coliform presence in water is as a result of oxide of nitrogen and oxide of sulphate while coliform is microbial algae presence.

From the nineteen physicochemical and microbial properties examined for SWAN PLASTIC BOTTLED WATER. The result obtained and revealed shows that all the parameters and properties analyzed were below the standard guideline limit of World Health Organization and Nigeria standard limit for drinking water (with the exception of taste and odour that is non- detected).

Based on the aforementioned findings and assertion from the result analyzed, SWAN plastic bottled water is safe and suitable for drinking, when focused on the physicochemical and microbial parameters understudied.

CONCLUSION

The five different bottled water examined for physicochemical and microbial parameters which include Sona, Santana, Aquafina, Eva and Swan bottled water. From the result obtained shows that the five different bottle water is suitable for drinking as par the parameters determined. So the aforementioned bottled water determined in the study is fit for drinking. The need for continual monitoring of bottled water is necessary because bottle water is perceived and assumed to be suitable and fit for drinking except errors from factory default, packaging materials among others that can introduce contaminant into the water. Unending monitoring assessment will bring to notice the presence of (if any) default or anomaly in the bottled water produced for public consumption. This

will enhance quality sustenance and public confidence in bottle water.

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