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Evaluation of Proximate Composition and Mineral Contents of Selected Locally Produced Beverages in Southwest Nigeria

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Abstract

The study evaluates the proximate composition and mineral contents of selected locally produced beverages in southwest Nigeria.Four locally produced beverages namely; Tigernuts, Kunu Zobo, and Coconut milk drinks were prepared and subjected to laboratory analysis for their nutritional and mineral contents using the standard method. The result showed that the four beverages are rich in moisture content and contained other nutrients to varying degrees. The study also discovered that the mineral content of the drinkis also appreciably high which makes them better alternatives to carbonated soft drinks that have been widely attributed to many health challenges. The study however discovered a wide variation in terms of the nutritional and mineral contents of the drinks as indicated by the results of the analysis of variance (ANOVA) tests with a p-value less than 5% level ($p < 0.05$). It is believed that moderate consumption of these local drinks by people of different categories and especially tourists will no doubt contribute to the overall health and welfare of the populace. Furthermore, it is also believed that the production and distribution of these local beverages can engender economic prosperity, especially for the unemployed. These local drinks could provide many benefits, especially in developing countries by playing important roles in ensuring food security, enhancing livelihoods, improvement of nutritional status and social well-being of the vulnerable groups.

Keywords: Local beverages; Proximate; Mineral; Tigernuts; Kunu; Zobo; Coconut milk

1. Introduction

The Oxford Learner Dictionary defines a beverage as a liquid that is meant for human consumption and to add to its basic function of satisfying thirst.The beverage is a drink other than water, an explanation of the commercial context. Beverages are further divided into alcoholic beverages and non-alcoholic. Non-alcoholic beverages refer to non-intoxication drinks or sweet carbonated drinks, which, do not have any liquor percentage, or in other words, yeast is not introduced to convert sugar into alcohol during the fermentation process. It has been stated that drinks form part of the culture of human society and the types of beverages consumed affect the composition of the modern diet (Stubbs and Whybrow, 2004; Pushpangadan*et al*., 2012).Despite the fact that all beverages contain water; however, water itself is not classified as a beverage. Furthermore, it has been reported that beverages are in the top ten contributing foods for several nutrients needed by the human body's growth and development. Many scholars including Pushpangadan*et al*. (2012) have reported that for so many decades, beverages have been used by humans in order to get vitality, and longevity, and have a good flow of digestion. Pofahl*et al* (2005) reported that non-alcoholic beverages are widely recognized for their various contributions to household food and nutrition in general, and especially, for their role in body hydration. Pofahl*et al* (2005) stated that some non-alcoholic beverages are rich in essential body nutrients such as essential amino acids, minerals, and vitamins, and are therefore commonly supplied in many programs targeting nutritional enhancement of households. Platania*et al* (2018) pointed out that there are numerous beverages and local ones in particular which give the body a good water balance and medicinal benefits. According to Pieroni*et al* (2021),

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many of the local beverages that include kunu, zobo, dates, tiger nuts, coconut, soybean, etc. have been produced and are very nourishing with the addition of other natural and local product to spice them instead of using sweetener such as sugar to improve on the taste. Platania*et al* (2018) also highlighted that some of these local beverages have high-energy content and are very rich in antioxidants among other compositions.

Coconut milk drink is obtained from coconut seed. According to Bakhru (2000), coconut (Cocusnucifera) is the stone of the drupes borne by the coconut palm, a member of the monocotyledonous family Palmae. It is known as the "wonder food" and is regarded as perfect diet because it contains almost all essential nutrients needed by the human body. Coconut milk may be considered as a substitute for cow milk. It may be used by the people who cannot tolerate cow milk. The milk of fresh coconut serves as a valuable food for children suffering from nutritional deficiency. Kunu drink is produced from grains such as maize, millet and sorghum. Over the years, people of different ages have enjoyed the refreshing taste of kunu (Ikpoh*et al*., 2013). Alcoholic addict (Ikpoh et al, 2013) also takes it as a remedy. Zobo drink is one of the popular local beverages in Nigeria.According to Ikpoh et al(2013), it is an aqueous extract of the dried reddish-brown petals (calyxes) of *Hibiscus sabdariffa* which is usually sweetened with sugar and sometimes flavoured with spices like ginger, hot pepper etc along with natural flavours like pineapple, orange or lime juice. Tigernut (*Cyperusesculentus*) belongs to the family Cyperaceae, which produces rhizomes from the base, and tubers which are somewhat spherical with sitting diameters 5-17 mm. According to Mohammed *et al* (2018), Tigernut milk, which is produced from Tigernut, is served as healthy drink in restaurants as a refreshing beverage, especially in countries like Spain where it is known to compete favorably with other soft drinks. A number of studies have been carried out on Tigernut and the milk derived from it and was found to contain a lot of beneficial nutrients and important minerals (Adedokun*et al*., 2014; Mohammed *et al*., 2018).According to Adedokun *et al* (2014), Tigernut has been under-utilized in the food industry especially in most developing nations of the tropic due to inconsistencies in the results of research carried out in the past; notwithstanding its nutritional and economic values as well as its potential as raw material. Considering the high nutritional benefits of these locally produced beverages, the present research therefore, is an attempt to evaluate their proximate composition and mineral contents for consumers and especially the tourists' acceptability and consumption in Nigeria.

2. Material and methods

2.1. Preparation of Zobo Drink

Zobo drink was prepared, using the following recipes, Zobo leaves (hibiscus flower), Ginger and garlic, Cloves (kanafuru), Pineapple, and Lime to garnish

2.1.1. Method of preparation

- The zobo leaves were washed thoroughly with cold water.
- The cloves were grinded into powder
- The ginger was thoroughly washed and the skin was peeled and blended
- The pineapple was peeled, cut, sliced, and blended
- The water was heated in a pot and the Zobo leaves and pineapple peel were added to the boiling water and were boiled for 5 minutes
- The ginger and cloves were added into the mixture and was boiled for 1 minute.
- The pineapple flavour and pineapple juice were added to the mixture and were allowed to boil for 1minute.
- The pot was then removed from heat and the Zobo drink was allowed to cool.
- The drink was filtered using a muslin cloth and was packaged in a transparent bottle.

2.2. Preparation of Kunu Drink

Kunu drink was prepared, using the following recipes: De-hulled millet, Ginger, Sweet potatoes, Cloves, Sugar and Water

2.2.1. The Procedures

- The millet grains were cleaned and washed thoroughly.
- The millet grains were steeped in water for about forty-eight (48) hours
- Wet milling was then carried out to get a paste
- The cloves was grinded into powder
- The ginger and sweet potatoes were thoroughly washed while the skin was peeled and blended
- The blended ginger, cloves and sweet potatoes were added to the millet paste and mixed thoroughly

- The preparation was then allowed to ferment for about 12 hours
- The entire content was sieved and allowed to settle for about seven (7) hours, after which a clear fluid will be above and the thick sediment at the bottom.
- The clear liquid was removed, leaving only the thick sediment.
- Hot boiled water was added into thick paste and stirred well for consistency until the preferred choice of thickness is achieved.
- The entire content was sieved again to remove the chaff.
- The taste was sweetened with sugar, refrigerate and serve chilled.

2.3. Tiger-Nut Milk

Tiger-nut milk is prepared using the following recipes: Tiger nuts, Date seeds, Ginger, Honey and Water

2.3.1. The Procedures

The method used for the extraction of tiger-nut milk is as follows. Fresh tiger nuts and date seeds were manually sorted and cleaned to remove foreign particles and unwanted materials. The nuts and seeds were soaked in water separately at room temperature for about twenty-four (24) hours. Both the soaked nuts and seeds together with ginger were milled into slurry using attrition several times with addition of water. The slurry was pressed using muslin cloth to extract the milk after which honey was added and mixed thoroughly. The extracted liquor was homogenized, cooled and stored in a clean container.

2.4. Preparation of Coconut Milk Extract

2.4.1. The ingredients

- Coconuts seeds
- Sugar
- Water

2.4.2. The Procedures

The method described by Adedokun *et al* (2014) although with modification, was used in the extraction of coconut milk. Coconut milk was prepared by shelling the nut and the meat was separated from the shell using a dull knife. The brown skin was removed from the coconut meat with a vegetable peeler and the meat was thoroughly washed and grated using attrition mill. The shredded coconut was then poured into a blender and blended until a very smooth texture was achieved. The mixture was filtered with a 0.18mm sieve and squeezed, to obtain a milky-white opaque emulsion with a sweet coconut flavor while the chaff was discarded. Sugar to taste was then added to the milk and mixed properly.

2.4.3. Laboratory Analysis

The laboratory tests were carried out in the Central Laboratories of the Federal University of Technology, Akure (FUTA). Samples were analyzed as follows:

2.4.4. Proximate analysis

The proximate composition of the samples was carried out using the standard method of the A.O.A.C (2000).

2.5. Determination of Mineral Contents of the Beverages

The mineral contents profile of the juices and drinks was evaluated following the procedures described by Adedeye and Adewoke cited in Bolarinwa *et al* (2021).

3. Results and Discussion

3.1. The Proximate Analysis

The proximate analysis carried out on the four selected local beverage samples is presented in Table 1 and 2. The ANOVA results showed that there is a significant difference in the percentage quantity of moisture, ash, protein, fat, fiber, and carbohydrate in the samples of the four selected local beverages.

3.1.1. Moisture

The results showed that Zobo had significantly higher moisture content (94.32%) than the other three beverages; this is followed by Kunu (91.05%) and Coconut (81.88%) while tigernuts recorded the least (77.91%).

3.1.2. Ash

For ash content, the percentage in tigernuts (0.78%) was found to be significantly higher than that of the other three beverages; this is followed by Kunu (0.34%) and Coconut (0.33%) while Zobo recorded the least (0.08%)

3.1.3. Protein

The content was significantly higher in Coconut (2.21%) which is followed by tigernuts (1.28%), Kunu (1.00%) while Zobo had the least (0.51%)

3.1.4. Fat

The fat content in Coconut (12.06%) was found to be significantly higher than the other three local beverages; this is followed by tigernuts (7.07%) and Kunu (1.02%) while Zobo recorded the least (0.44%).

3.1.5. Fiber

The fiber content in tigernuts (5.11%) was found to be significantly higher than the other three; this is followed by Coconut (3.81%) and Kunu (0.09%) while Zobo had none (0.00%).

3.1.6. Carbohydrate

The percentage carbohydrate in tigernuts (15.20%) was found to be significantly higher than that of the other three beverage samples. This is followed by Zobo (13.41%) while the least was recorded in Coconut (7.68%) and Kunu (7.45%).

Table 1 The Results of Analysis of Variance (ANOVA) on the Proximate Constituents of the Beverages

		Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Moisture	Between Groups	353.694	3	117.898	21732.378	0.000
	Within Groups	0.022	4	0.005		
	Total	353.716	7			
Ash	Between Groups	0.508	3	0.169	677.533	0.000
	Within Groups	0.001	4	0.000		
	Total	0.509	7			
Protein	Between Groups	3.046	3	1.015	1425.047	0.000
	Within Groups	0.003	4	0.001		
	Total	3.049	7			
Fat	Between Groups	181.407	3	60.469	19664.683	0.000
	Within Groups	0.012	4	0.003		
	Total	181.419	7			
Fiber	Between Groups	40.726	3	13.575	15739.454	0.000
	Within Groups	0.003	4	0.001		
	Total	40.729	7			
Carbohydrate	Between Groups	94.132	3	31.377	2598.549	.000
	Within Groups	.048	4	0.0012		
	Total	94.181	7			

Table 2 The Post-hoc Test (Duncan Multiple Range Test) Showing Means Separation of the Proximate Constituents

Sample	%Moisture	% Ash	%Protein	%Fat	%Fiber	%Carbohydrate
Zobo	94.32^{d}	0.075^{a}	0.51^{a}	0.435^{a}	0.00^{a}	13.41^{b}
Tigernuts	77.91^{a}	0.775^{c}	1.28^{c}	7.065^{c}	5.11^{d}	15.20^{c}
Kunu	91.05^{c}	0.335^{b}	1.00^{b}	1.02^{b}	0.085^{b}	7.45^{a}
Coconut	81.88^{b}	0.325^{b}	2.21^{d}	12.06^{d}	3.81^{c}	7.68^{a}

Note: Mean score with different superscript letters (a - d) are significantly different (P<0.05) along the column

3.2. The Mineral Analysis of the Selected Local Beverages

The results of the laboratory analysis for the mineral content analysis of the selected local beverage samples are presented in Table 3and 4.The results of the analysis of variance (ANOVA) carried out revealed that there is statistical significant difference in the quantity of seven minerals tested for in the samples of the selected local beverages.

3.2.1. Sodium (Na)

The results show that the average quantity of sodium in Coconut (500.45ppm) drink sample is significantly higher than the other three local beverages. This is followed by that of tigernuts (143.50ppm) and Kunu (32.45ppm) while Zobo recorded the least (18.73ppm).

3.2.2. Potassium (k)

The amount of K in tigernuts was found to be significantly higher than the other three beverages. This is followed by Coconut (3240.50ppm) and Zobo (1867ppm) while Kunu recorded the least.

3.2.3. Calcium (Ca)

Zobo recorded the highest amount of Ca (398.50ppm) which is significantly higher than the other three local beverages; this is followed by that of Coconut (251.53ppm) and tigernuts (199.25ppm) while Kunu shared the least (44.40ppm).

3.2.4. Iron (Fe)

The amount of Fe in Coconut (251.53ppm) was significantly higher than the other three, this is followed by tigernuts (9.80ppm), Zobo (5.10ppm) and Kunu recorded the least (2.88ppm).

3.2.5. Zink (Zn)

For Zn, the amount in Zobo (9.90ppm) and Coconut (8.68ppm) was significantly higher than the quantity found in Kunu (5.80ppm) and tigernuts (5.35ppm).

3.2.6. Manganesse (Mn)

In terms of quantity of Mn, Zobo had the highest (17.75ppm) which is significantly higher than the other three selected beverages; this is followed by Coconut(10.20ppm) tigernuts (3.45ppm) and Kunu shared the least (1.30ppm).

3.2.7. Copper (Cu)

The analysis shows that Coconut recorded the highest (9.53ppm) which is significantly higher than those of other three beverages; this is followed by tigernuts (3.75ppm) while Zobo and Kunu however shared the least; 2.32ppm and 2.22ppm respectively.

Table 3 The Results of Analysis of Variance (ANOVA) on the Mineral Constituents of the Beverages

		Sum of Squares	df	Mean Square	F	Sig.
Na	Between Groups	303289.677	3	101096.559	242612.333	0.000
	Within Groups	1.667	4	0.417		
	Total	303291.344	7			
K	Between Groups	16376975.215	3	5458991.738	3969.399	0.000
	Within Groups	5501.076	4	1375.269		
	Total	16382476.291	7			
Ca	Between Groups	128151.056	3	42717.019	13076.505	0.000
	Within Groups	13.067	4	3.267		
	Total	128164.122	7			
Fe	Between Groups	171.228	3	57.076	4415.929	0.000
	Within Groups	.052	4	0.013		
	Total	171.279	7			
Zn	Between Groups	29.268	3	9.756	38.401	0.002
	Within Groups	1.016	4	0.254		
	Total	30.285	7			
Mn	Between Groups	330.745	3	110.248	314995.238	0.000
	Within Groups	.001	4	0.000		
	Total	330.746	7			
Cu	Between Groups	71.525	3	23.842	1911.152	0.000
	Within Groups	.050	4	0.012		
	Total	71.575	7			

Table 4 The Post-hoc Test (Duncan Multiple Range Test) Showing Means Separation of the Mineral Constituents

Sample	Na (ppm)	K (ppm)	Ca(ppm)	Fe (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)
Zobo	18.73^{a}	1867^{b}	398.50^{d}	5.10^{b}	9.90^{b}	17.75^{d}	2.32^{a}
Tigernuts	143.50^{c}	4181.09^{d}	199.25^{b}	9.80^{c}	5.35^{a}	3.45^{b}	3.75^{b}
Kunu	32.45^{b}	392.96^{a}	44.40^{a}	2.88^{a}	5.80^{a}	1.30^{a}	2.22^{a}
Coconut	500.45^{d}	3240.50^{c}	251.53^{c}	14.92^{d}	8.68^{b}	10.20^{c}	9.53^{c}

Note: Mean score with different superscript letters (a - d) are significantly different ($P<0.05$) along the column

3.3. The Nutritional Contents of the Selected Local Drinks

It is evidently clear from the results of the proximate analysis that all the four selected locally-made beverages have high moisture content which make them good sources of fluid to the body when consumed. Worthy of note is the fact that the percentage moisture content determined for the local drinks in this study are comparably higher than those that were established for fourteen brands of fruits juice sold in Onitsha main market in Nigeria which ranged from 82.14% -92.38% (Braide *et al*., 2012). Based on this finding, these four locally produced beverages can be seen as ready local alternatives to imported refreshing drinks and the popular carbonated soft drinks. In the same way, the percentage

protein content in the four selected drinks in this study except for Zobo is relatively high and comparable to those of the fourteen brands of juice earlier mentioned.

Also, the percentage of ash content is generally higher in these drinks than in the fourteen drinks studied by Braide *et al* (2012). This is true for the percentage of fat and fiber content. The carbohydrate content in these beverages is also comparable to that found in the fruit juices in the referenced study. It is also striking to note that a reasonable percentage of fat and fiber are present in the selected beverages in this study while they were practically lacking in the fourteen brands of fruit juices being referred to.

It is worthy of note that the percentage content of moisture determined for Zobo in the present study compared well with that established by Akujobi *et al* (2018) in a study titled 'Nutrient Composition, Phytochemical and Sensory Properties of Zobo drinks substituted with Pineapple and Orange juices'. While the percentage content of ash, fiber, and protein was found to be relatively higher; that of carbohydrates was however found to be lower. The difference that existed in the percentage content of these nutrients could be attributed to the materials used in the preparation of the selected drinks in this study. Zobo drinks for example have been identified to have some health benefits that include their applications in herbal/traditional medicine to treat health conditions such as hypertension and urinary tract infections (Akujobi *et al*, 2018). According to Ekenam (2018), there are a handful of studies that demonstrated extracts of Hibiscus Sabdariffa thatare used in Zobo production to have a lipid-lowering activity capable of reducing the risk of hyperlipidemia and cardiovascular diseases such as atherosclerosis and coronary heart diseases. The health benefits of Zobo drink have increased its popularity and consumption by different categories of people in society, including both the rich and the poor (Ezekiel et al., 2016; Chukwuet al., 2017).

The percentage fat content of Zobo in the present study was relatively lower than 0.87% reported by Ekanem *et al* (2018) for Zobo drinks sold in Ikot Ekpene Metropolis located in Akwa Ibom state in Nigeria. The brand of Zobo drink in this study could therefore be suitable for people who are interested in weight management and also in the prevention of diseases associated with a high dietary fat intake or consumption. The fact that Zobo had the least percentage protein content among the four selected drinks also makes it suitable for people with liver problems who will require a low level of protein in their diet. While some percentage of Ash was established in Zobo drink produced in the present study, none was observed in the Zobo drinks sold in Ikot Ekpene based on the findings ofEkanem *et al* (2018).

The percentage moisture content of Kunu drink in the present study compares well with 91.07% obtained by Terna*et al* (2002) from Kunu Zaki in which sweet potato was used as a saccharification agent. The percentage protein content of Kunu in the present study was however much lower than 3.1a9%, 3.74%, 7.86%, and 3.45% reported for four different Kunu drinks using malted rice, sweet potato, soybean, and Canaba farinose as saccharification agent respectively. The difference in percentage protein content could be attributed to the types of saccharification agents used in their preparations. Worthy of note also is the finding that the percentage fat content of Kunu in the present study was relatively higher than that established for the different Kunu drinks in the referenced study. It is also important to note here that the percentage carbohydrate content in the Kunu drink in the present study is higher than the (2.69-5.84%) range determined for the Kunu drinks in the referenced study.

The nutritional contents and values of tigernut drinks are found to be relatively higher than that of Zobo and Kunu drinks except for the percentage moisture content. Specifically, the drink is found to be relatively richer in fat content. This is corroborated by Sanchez-Zapata *et al* (2012) and FAO/WHO/UNU (2002) who reported that Tigernuts in comparison to other starchy roots and tubers such as sweet potatoes, yam, and cassava, have interestingly significantly higher fat content and could contribute more than 73% of fat to a child's daily fat need and more than 49% of fat to an adult daily fat requirement.

Sanchez-Zapata also reported that the fat content of Tigernuts is relatively similar to that of nuts and seeds but is higher than cereals and compares well with that of soya beans. The fiber content is also found to be appreciably high making it a good drink that can aid food digestion. According to Wardlaw and Kessel (2002), fiber aids in the alleviation of flatulence problems hence tigernuts fiber could be explored in formulating diets for treating indigestion, constipation, and non-communicable diseases such as colon cancer, diverticulosis, coronary heart disease, and obesity. A relatively higher percentage carbohydrate content of tigernuts drink makes it a good alternative to soft drinks as a means of boosting human energy. The nutritional content of tigernuts established in this study though high, is, however, lower than that obtained for fresh tigernut by Mohammed *et al* (2018).

For Coconut milk, the % moisture content obtained for tigernut milk in this study compares well with the 79.29% established by Adedokun *et al* (2014) but less than 88.65% obtained by Belewu *et al* (2014). The percentage ash, protein and carbohydrate contents of tigernut milk in this study were lower than the values reported by the referenced two

studies. The fat and fiber contents of the one in this study were however greater than those established in their separate studies. Due to the high nutritional quality of Coconut milk drink, it can be a good substitute for those who have allergy to dairy products particularly milk in order to meet their nutritional needs, especially for protein, fat, and fiber content.

According to Eske (2022), the milk from coconut can be used for stimulating weight loss and lowering cholesterol. Coconut milk is also reported to contain high levels of saturated fat, making it a calorie-rich food (Eske, 2022). The use of Coconut milk can also be seen as one of the ways to tackle the problem of malnutrition in Nigeria in view of its availability and relatively cheaper costs. By extension, this can provide job opportunities for a good number of people in the areas of production and marketing.

3.4. The Mineral Contents of the Selected Local Drinks

The mineral contents of the four selected drinks in this study are higher than those established by Ekpete and Edori (2013) for nine Nigerian fresh fruitscollected from the Rumuolumeni market in Rivers State. The fruits include guava, banana, pawpaw, orange, apple, watermelon soursop, bush, mango, and pineapple. In the same manner, the sodium (Na) content established for tigernuts drinks and Coconut milk drinks in this study was found to be higher than those reported by Eksi and Kirtis (2016) in sour cherry juice collected from different companies in three different years (2009 to 2011) in Turkey. However, that of Zobo and Kunu established in the present study were however comparable with the study. The values of potassium (K) compares well while that of tiger nuts was found to be appreciably higher. The calcium (Ca) contents of the selected local drinks were higher than that of the referenced study except for kunu drinks. It is also interesting to note that mineral contents especially that of Na, K and Ca determined for the four local drinks is noticeably higher than the one established by Braide *et al* (2012) for fourteen brands of processed fruit juices sold in Onitsha main market in Anambra state of Nigeria. It was also found out that the mineral content of the selected local beverages in this study was significantly higher than those reported by Hassan and Emifoniye (2018) for seven soft drinks sample of locally produced commercial brand sold in Nigeria. It should be noted also that the mineral contents established for Tigernut drinks in this study were also found to be relatively higher than those reported by Mohammed *et al* (2018) for fresh tiger nut collected from Anyigba market in Dekina Local Government Area, Kogi State, Nigeria.

Generally speaking, it can be said that the four studied local beverages are very rich in mineral content considering the high concentration established for them. Iron (Fe) according to Oluyemi *et al* (2006) is said to be an important element in the diet of pregnant women, nursing mothers, infants, convulsing patients, and the elderly to prevent anaemia and other related diseases. According to the study, Fe is required for energy and endurance because it delivers oxygen throughout the body. However, it is necessary only in small amounts for optimal health. Fe is the functional component of hemoglobin and other key compounds used in respiration, immune function, and cognitive development.The Fe content in tiger nuts (100 g) could be enough to cover the daily minimum needs (providing about 67-68 %) for children. Tigernuts could provide about 27-64% of adolescents' or adults' daily iron needs and 18-49% of pregnant mother's daily iron needs.

Zinc according to Dimari and Hati (2010) is involved in thousands of bodily functions, such as proper cell growth and testosterone production.Zinc is said to be an essential trace element for protein and nucleic acid synthesis and normal body development and also plays a central role in growth and development (Melaku *et al*., 2005; Ekpete and Eldori, 2013). According to the studies, it has also been found to be very vital during periods of rapid growth such as infancy, adolescence, and during recovery from illness. Potassium according to Mohammed *et al* (2018) helps in nerve impulse transmission and it is a major cat ion of intracellular fluid. It is an essential nutrient used to maintain fluid and electrolyte balance in the body (Hassan and Emifoniye, 2018). High potassium to low sodium ratio of tigernuts for instance may be imperative in diet formulations for patients with high blood pressure (hypertension) and edema as well.

Tigernuts have been established to contain protective nutrients because they could supply adequate zinc, copper, iron, vitamin C and E. Zinc is vital in several metabolic reactions and may play an important role in alcohol metabolism, immunity, sexual development, and reproduction. Copper assists in iron metabolism. It works with many antioxidants,and enzymes especially those involved in protein metabolism and hormone synthesis. The nutritional quantity and quality of these locally made drinks make drinks therefore, showcasing them as a better option as against conventional soft drinks. According to Ristovska *et al* (2012), frequent consumption of soda is directly related to the rapid wearing of enamel; thereby causing lesions to form on the tooth surface and consequently leading to decay and loss. More importantly, soft drinks have been linked to several health problems.

4. Conclusion

In conclusion, the results of the study have provided insights into the nutritive value of four selected locally produced beverages namely; Tigernuts, Kunu Zobo, and Coconut milk drinks. The result showed that they are rich in moisture content and contained other nutrients to varying degrees. The study also discovered that the mineral content of the drinks are also appreciably high which make them better alternatives to carbonated soft drinks that have been widely attributed to many health challenges. The study however discovered a wide variation in terms of the nutritional and mineral contents of the drinks as indicated by the results of the analysis of variance (ANOVA) tests with a p-value less than 5% level ($p < 0.05$). It is believed that moderate consumption of these local drinks by people of different categories will no doubt contribute to overall health and welfare of the populace. Furthermore, it is also believed that the production and distribution of these local beverages can engender economic prosperity especially for the unemployed. These local drinks could provide many benefits, especially in developing countries by playing important roles in ensuring food security, enhancing livelihoods, improvement of nutritional status and social well-being of the vulnerable groups.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no competing interests.

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