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QUALITY EVALUATION OF SOME LOCAL BEVERAGES (ZOBO DRINK, KUNUN ZAKI, KUNUN AYA AND TAMARIND JUICE) SOLD IN SABON GARI MARKET KANO STATE

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Abstract

The objectives of the study were to evaluate the physicochemical properties, microbial load, anti-oxidant properties and anti-nutritional content of locally produced beverages (Zobo drinks, Kunun Zaki, Kunun Aya and Tamarind) sold within sabon Gari Market of Kano state Nigeria. The drinks were analysed for microbial load, Physico-chemical properties, anti-nutritional contents and anti-oxidant properties. Based on the pH results tamarind is high acid drink while Kunun zaki, Kunun aya and zobo are both low acid drinks. The titrable acidity of kunun zaki and tamarin drink is high compared to the other drinks.The microbial loads of all the drinks were high, which indicates possible recontamination or poor hygienic practices and or use of reused plastic bottles. The phytate content of zobo drinks was higher than that of Kunun zaki and kunun Aya and local Tamarind drinks having the lowest value. The oxalate and tannin content of the beverages ranged from 0.49 – 0.95mg/ml. and 0.22 – 1.07mg/ml respectively. The flavonoid and phenolic content was highest in zobo drink with a value of 0.44±0.00 mg/ml and 18.95±2.41 respectively. There was a significant difference ($p \geq 0.05$) between the samples except the total phenol content of Kunun Zaki and Kunun Aya which shows no significant difference.

***Keywords**: Zobo, Kunun zaki, Kunun aya, Tamarind juice, Quality*

Introduction

Local Nigerian indigenous drinks are becoming popular in both urban and rural communities because they are cheaper than imported drinks, these beverages are well accepted among Nigerians (Oboh and Okhai, 2012). Beverages in generals are food items that are quite different and distinct from other foods items; mainly in liquid state but have lower food values relative to food products (Adelekan et al., 2014). Beverages are important sources of nutrients and phytonutrients, phenolic acids and flavonoids (Ferruzzi et al., 2020). They are widely consumed, especially by children, pregnant women, the sick, and the elderly. They are also used during the weaning of infants, it's also reported that, Social, religious, nutritional, and therapeutic values are associated with an increase of their consumption (Ezekiel et al., 2018).

A research shows that Street foods are food or drinks, sold by street vendors which is becoming highly acceptable by consumers due to their low price and constant availability at a given time (Mohd Nawawee et al., 2019). Besides the poor shelf life, of these locally processed beverages and the fact that these drinks processed in condition lacking quality assurance and control measures (Kigigha et al., 2018). Its Consumption has been reported to potentially increase the risk of foodborne diseases caused by a wide variety of pathogens, therefore Careful beverage choices could be considered a part of a healthy dietary pattern (Mohd Nawawee et al., 2019).

Zobo drink is a non-alcoholic local beverage produced from the dried petals, (Ekanem, 2018). An acid-succulent calyces of the flower *Hibiscus sabdariffa* by boiling and filtration. In Nigeria a wide variety of foods are prepared through indigenous technology from many plant Products (Adelekan et al., 2014).The calyce of Hibiscus sabdariffa is a considerable source of nutrients, antioxidants and phytochemicals such as flavonoids. The sour taste of Zobo is associated with the organic acids contents such as ascorbic, malic and tartaric acid and the leaves of zobo plants could also be used to produce syrup, gelatin, jam and jelly (Akujobi et al., 2018). It can also be used as vegetables and the seeds as source of oil (Ezeigbo et al., 2015). The drinks can be use traditionally as medicine;

for the treatment of hypertension and urinary tract infection, Several studies have shown that extracts of Hibiscus sabdariffa have a lipid lowering activity which could reduce the risk of hyperlipedemia and cardiovascular diseases such as atherosclerosis and coronary heart diseases (Akujobi et al., 2018). It can also be used in folk medicine against many complaints such as high blood pressure, liver diseases and fever (Oboh and Okhai, 2012).

Kunun-zaki is a traditionally fermented non-alcoholic beverage mostly consumed in Northern Nigeria (Sengev et al., 2012). Is a cereals based beverages utilized in Nigeria (Terna and Ayo, 2002). With low viscosity (Oboh and Okhai, 2012). The word *Kunun-zaki* is a Hausa word meaning sweet beverage (Sengev et al., 2012). It is consumed anytime of the day by both adults and children as a breakfast food drink (Ndulaka et al., 2014). It can be produced either from millet (Pennisetum typhoideum), sorghum (Sorghum bicolor), or maize (Zea mays) (Sengev et al., 2012).

According to (CK, 2019) It is Nutritionally, made up of 87-92% moisture, 3.19-7.86% crude protein, 0.37- 0.75% crude fat, 0.93-1.20% ash and 2.69-5.84% carbohydrate, it can also lead to the reduction of blood cholesterol, lowering the risks of diabetes, and prevention of blood clot formation. It can be used as weaning drinks for infants in some communities (Oboh and Okhai, 2012).

Tiger nut drinks, Tiger nut "Cyperus esculentus lativum" is an underutilized tuber of family Cyperaceae, which produces rhizomes from the base of the tuber that is somewhat spherical (Gambo and Da'u, 2014). It is mainly harvested in Spain, West Africa countries like Nigeria, Senegal, or Ghana, and also in South America, as in Chile (Roselló-Soto et al., 2019). It can be used for the production of drink/milk, which can serve as substitute of traditional cow milk (Gambo and Da'u, 2014). The beverage is an emulsion of oil droplets in an aqueous phase and contains starch granules and small solid particles, Starch granules are related to product stability, in particular regarding color and texture (Roselló-Soto et al., 2019).

According to (Gambo and Da'u, 2014), the milk is nutritious and healthy when compared with any other soft drinks, because It can contributes to the reduction in the in cholesterol by diminishing the 'bad' cholesterol low density Lipoprotein (LDL), and increasing the 'good' cholesterol, high density Lipoprotein (HDL), It's also has an antioxidant effect. (Roselló-Soto et al., 2019) confirmed that In Europe and United States, it is of high interest as an

alternatives to milk and for gluten-free diets. Research also shows that Cyperus esculentus was reported to help in preventing heart, thrombosis and activates blood circulation, responsible for preventing and treating urinary tract and bacterial infection, assist in reducing the risk of colon cancer and lastly thought to be beneficial to diabetics and those seeking to reduce cholesterol or lose weight (Gambo and Da'u, 2014).

Tamarind (*Tamarindusindica*) is a leguminous tree that belongs to the family Fabaceae with Subfamily Caesalpiniaceae (Van-der-Stege et al., 2011). The plant is believed to be indigenous to tropical (Chimsah et al., 2020). It is Known as inli in Hindu-Urdu, asana jawa in India, tamarindo in French, tamarin, tamariner, tamarier des Indes in Dutch and German, tamarinde in Italian, taman in Philippines and locally called Jabbe, Stamiya in Fulfulde and Hausa in Nigeria (Toungos, 2019). Many types of traditional beverages are available in Nigeria but only a few like kunun-zaki, braga, soborodo are popular among the populace. Tamarind beverage is among those beverages which are yet to be widely accepted in Nigeria. (Adeola and Aworh, 2010). It utilization increasingly becoming a commercially important underutilized tree crop worldwide (Chimsah et al., 2020). It has long been a popular drink in the Tropics and it is now bottled in carbonated form in Guatemala, Mexico and Puerto Rico (Toungos, 2019).

The uses of Tamarind is uncountable now ranging from; Medicinal uses (having the ability to reduce inflammation throughout the body, improve vision, boost respiratory health, heal skin conditions, and improve the digestive system of the body) it also has the ability to relieves pain, strengthens the immune system, reduces fever, lowers cholesterol and improve cardiovascular health, treats piles, and protects against parasites and worms (Toungos, 2019).

Methodology

Sample Collection

The samples of locally produced Zobo drinks, Kunun Zaki, Kunun Aya (Tiger nut drinks) and Tamarind beverage were selected at random from Sabon Gari market of Kano State, Nigeria.

Laboratory analysis of the samples

Determination of physicochemical properties of the samples

pH determination: The pH of the samples was determined using the method described by (Nkama et al., 2010). using pH meter (TECPEL pH meter, model 705) after standardization with pH 4 and pH 7 buffers (BDH, England).
Brix reading determination: The brix of the samples was determined according to the method described by (Bankole et al., 2013) using hand refractometer.
Determination of titratable acidity (TTA)*:* The total titratable acidity (TTA) of the samples was determined using the method described by (Nkama et al., 2010), 10 ml of each sample was titrated with 0.1 N sodium hydroxide to phenolphthalein end point (pink). The titratable acidity was calculated for each sample.
Turbidity was measured in nephelometric turbidity units (NTU) as described by (Nkama et al., 2010).

Determination of Microbial profile of the samples
Determination of Total Bacterial total coliform and total fungal Counts: was evaluated according to the method of Edem and Elijah, 2016, As described by (CK, 2019) and (Ekanem, 2018). The samples were subjected to 10-fold serial dilutions. Aliquots (0.1 ml) of appropriate dilutions for each sample were plated by the pour plate method in triplicates onto nutrient agar, MacConkey agar and and Potato dextrose agar (PDA) plates in triplicates for total heterotrophic bacteria count, total coliform count and total fungi count respectively. These were incubated at 30 0C for 24 hours. Resulting colonies were counted with the aid of a colony counter and the colonial morphologies noted.

Determination of anti-oxidants properties of the samples
Determination of total phenol: The total phenol content of the samples was determined using the method described by (Singleton et. al., 1999). 0.2 ml of the extract was mixed with 2.5ml of 10% Folinciocalteau's reagent and 2ml of 7.5% Sodium carbonate. The reaction mixture was subsequently incubated at 45^{o}C for 40mins, and the absorbance was measured at 700nm in the spectrophotometer, gallic acid was used as standard for estimation of phenol.
Determination of Total flavonoid: The total flavonoid content of the samples was determined using a colorimeter assay described by (Bao et al., 2005). 0.2ml of the extract was added to 0.3ml of 5% $NaNO_3$ at zero time. After 5min, 0.6ml of 10% $AlCl_3$ was added and after 6min, 2ml of 1M NaOH was added to the

mixture followed by the addition of 2.1ml of distilled water. Absorbance was read at 510nm against the reagent blank and flavonoid content was expressed as mg rutin equivalent.

Determination of free radical scavenging ability: The free radical scavenging ability of the extract against DPPH (1, 1- diphenyl-2-picryhydrazyl) using a method described by (Gyamfi et. al. 1999). 1ml of the extract was mixed with 1ml of the 0.4mM methanolic solution of the DPPH, the mixture was left in the dark for 30min before measuring the absorbance at 516nm.

ABTS scavenging ability: 2, 2'-azino-bis (3-ethylbenthiazoline-6-sulphonic acid) (ABTS) scavenging ability. The ABTS scavenging ability of the samples was determined according to the method describe by Re et al., (1999). The ABTS was generated by reacting an (7mM).ABTS aqueous solution with $K_2S_2O_8$ (2.45 mM/l, final conc.) in the dark for 16hours and adjusting the absorbance at 734nm to 0.700 with ethanol 0.2 of the appropriate dilution of the extract was then added to 2.0ml of ABTS solution and the absorbance was read at 732nm after 15mins. The TROLOX equivalent antioxidant capacity was subsequently calculated.

Determination of anti-nutritional content of the samples

Tannin content determination: It was determined using the method described by (Makkar and Goodchild. 1996). About 0.2g of finely ground sample was weighed into a 50ml sample bottle. 10ml of 70% aqueous acetone was added and properly covered. The bottle were put in an ice bath shaker and shaken for 2hours at 30^0C .Each solution was then centrifuge and the supernatant store in ice. 0.2ml of each solution was pipetted into the test tube and 0.8ml of distilled water was added. Standard tannin acid solutions were prepared from a 0.5mg/ml of the stock and the solution made up to 1ml with distilled water. 0.5ml of Folinciocateau reagent was added to both sample and standard followed by 2.5ml of 20% Na_2CO_3 the solution were then vortexed and allow to incubate for 40minutes at room temperature, its absorbance was read at 725nm against a reagent blank concentration of the same solution from a standard tannic acid curve was prepared (Makkar and Goodchild. 1996).

Phytate content determination: Phytate was determined according to the method of Wheeler and Ferrel (1971). 4g Sample was soaked in 100ml of 2% HCl for 3hrs and then filter through a No 1 Whatman filter paper. 25ml ml was

taken out of the filtrate and placed inside a conical flask and 5ml of 0.3% of ammonium thiocyanate solution were added as indicator. After which 53.5 0f distilled water was added to give it the proper acidity and this was titrated against 0.00566g per milliliter of standard iron (iii) chloride solution that contain about 0.00195g of iron per milliliter until a brownish yellow colouration persist for 5min.

Oxalate content determination: Oxalate was determined by soaking 1g of the sample in 75ml of 1.5N H_2SO_4 for 1hr and then filtered through a No 1 Whatman filter paper. 25ml ml was taken out of the filtrate and placed inside a conical flask and this were titrated hot about (80-90^{oc}) against 0.1m $KMnO_4$ until a pink colour that persist for 15 secs. Day and Underwood (1986);

Statistical analysis

Except otherwise stated, all determinations were carried out in triplicates, subjected to analysis of variance ANOVA and the means were separated by New Duncan Multiply Range Test (NDMRT). Mean and standard deviation of all the samples were calculated and compared. SPSS for Windows program version 21.0 was used to analyze the results obtained.

Results and Discussion

Table 1: Physicochemical properties of samples

Parameters	pH	BRIX @ 27^{0}C	TTA (%)	TURBIDITY (NTU)
Zobo	6.10±0.14^a	6.50±0.07^c	0.48±0.04^c	73.20±0.14^a
Kunun zaki	5.60±0.14^b	8.10±0.14^b	1.26±0.14^b	66.25±0.35^b
kunun aya	6.15±0.07^a	10.40±0.28^a	0.23±0.00^d	61.13±0.35^c
Local tamarind	3.90±0.14^C	7.73±0.11^b	1.43±0.35^a	50.50±0.14^d

Values are Mean of triplicate determination ± S.D Different superscripts on the same row are significantly different ($p \leq 0.05$) according to Duncan Multiply range test.

Key

TVBC = Total Viable Bacterial Count

TCC = Total Coliforn Count

TFC = Total Fungal Count

Table 1. Shows the result of the Physicochemical properties of the samples, the pH of Zobo, Kunun Zaki, Kunun aya Tigernut drinks ranged from 6.10 – 6.60 indicating the low acidic content of the samples, moreover the pH value of Local tamarind drinks were 3.90 indicating the high acidic content of the tamarind beverages. (Adeola and Aworh, 2010) also confirmed that the acid content of tamarind beverage is desirable from food processing standpoint, since it is important in determining the quality of the juices. From the results it was observed that microbial load of the samples decreased with decreases in the pH, which is in agreement with (Adeola and Aworh, 2010) which stated that acidity inhibits the growth of surviving heat resistant microorganisms. It has been reported that fermented foods with low pH have some antimicrobial activities.PATTAR (2012 reported a pH value of 2.08 to 3.09 for Tamarind juice which is slightly lower than the observed value in this study. (Elmahmood and Doughari, 2007) studied Kunun zaki from vendors in girei Local Government and found the pH values between the range of 3.44 and 4.34, this is in conformity with the values obtained in this study.
Fron the result Zobo and Kunun Aya has the lowest total tittratable acid of 0.45 and 0.23 respectively while kunun zaki and Local tamarind drinks has the highest total titratable acid of 1.26 and 1.43 respectively. Ajayi et al 2016 reported a value of 0.14 to 0.21 titratable acidity value for zobo samples. Acidity contributes to the development of flavour by maintaining a proper sugar - acid ratio thereby modifying the sweetness of sugar and palatability of food products, lends tartness to taste and also provides a thirst-quenching effect by encouraging saliva formation in the mouth (Adeola and Aworh, 2010). (Agarry et al., 2010) reported a marked decrease in pH with concomitant increases in titratable acidity of kunun zaki samples . Pattar 2012 reported acidity values between 2.72 and 4.10 for tamarind juice extracted using different methods; this is in line with the findings in this study.

Turbidity of the samples

Table 2: Microbial Profile

Parameters	TVBC (cfu/ml)	TCC (cfu/ml)	TFC (cfu/ml)
Zobo	$3.82\times10^4\pm43.47^a$	$2.29\times10^4\pm27.12^a$	$1.63\times10^4\pm18.59^a$
Kunun zaki	$3.23\times10^4\pm37.05^a$	$3.49\times10^4\pm40.30^a$	$3.77\times10^4\pm42.92^a$
kunun aya	$1.81\times10^4\pm20.90^a$	$2.22\times10^4\pm25.84^a$	$1.72\times10^4\pm20.05^a$

Local tamarind	$1.40\times10^4\pm16.31^a$	$1.89\times10^4\pm22.13^a$	$1.43\times10^4\pm16.58^a$

Values are Mean of triplicate determination ± S.D Different superscripts on the same row are significantly different ($p\leq 0.05$) according to Duncan Multiply range test.

Key

TVBC = Total Viable Bacterial Count
TCC = Total Coliforn Count
TFC = Total Fungal Count

The results of microbiological counts of locally produced beverages: Zobo, Kunun Zaki, Kunun aya (tigernut drinks) and tarmarind drinks were shown in Table 2: From the Table, the total viable bacterial count of Zobo and Kunun Zaki was 3.82×10^4 cfu/ml and 3.23×10^4 cfu/ml respectively which is higher than that of tigernut and tarmarind drinks 1.81×10^4 and 1.40×10^4 cfu/ml. According to (Mohd Nawawee *et al.,* 2019), Total viable counts can be used to measure the level of overall bacterial contamination of food or beverage samples tested. The level of average bacterial contamination in the beverages samples tested in this study ranged from $1.40 – 3.82 \times 10^4$ CFU / mL which was considerably low when compared to the values reported by **Mohammed *et al., 2017.*** (Kigigha et al., 2018) also reported the bacterial contamination of Zobo drink with values of < 3.0 - 1.23 x 10^4 cfu/ml in Kano. (Elmahmood and Doughari, 2007) found bacterial count values ranging from 2.5 - 4.6 x 10^4 cfu/ml on kunun zaki samples which are the values obtained in this study were within the values obtained. **And the counts recorded in this research was lower than the standard set by the (ICMSF, 1996) for aerobic count of 10^6 cfu/g** Spices are usually added in small quantities to improve taste and flavour and as these are agricultural commodities, which may contain a high level of microbial impurities (Adeyemi and Umar, 1994)

Total coliform is a suitable indicator to detect fecal contamination in food products. The total coliforn count of the beverages ranges from $1.4 – 3.7 \times 10^4$ cfu/ml The average coliform count is well above the zero value recommended for safety. Enetimi *et al.,* 2020, reported a coliform value of 2.27 Log cfu/ml in locally Processed Beverages in Reused Plastic Container. if coliform detected in beverages it indicates contamination, such drinks should be devoid of coliforms and the reported levels of coliform that exceeded threshold were

possibly due to the unhealthy anthropogenic scavenging and reusing plastic containers in trash cans and dumpsite.

Meanwhile the total fungal counts of the beverages sold within sabon gari market of Kano State ranged from 1.43–3.77× 10^4 cfu/ml, which is higher than the total fungal count of kunu-aya (2.26-2.86 log10 CFU/mL) consumed by students of Kaduna State University as reported by (Ire *et al.*, 2020). Another research also shows that Fungal count of kunun zaki sold in Osun State ranged from 3.3 x 10^6 to 8.0 x 10^6 CFU/ml (Imoukhuede et al.). which is higher than the value obtained in this research. (Enetimi *et al.*, 2020), also shows that the fungal contamination of locally Processed Beverages in Reused Plastic Container was 3.39 Log cfu/ml, while coliform count was 2.27 Log cfu/ml. The presence of the bacterial, fungal and coliform counts indicates some degree of contamination, but within the acceptable level (threshold limit 105) of the Food and Agricultural Organization (Enetimi *et al.*, 2020).

Table 3. Shows the Anti-nutritional contents of the samples. Anti-nutrients are the key factor, which reduce the bioavailability of various components of the cereals and legumes (Samtiya et al., 2020). From the results the phytate content of zobo drinks was higher than that of Kunun zaki and kunun Aya and local Tamarind drinks having the lowest value, this could be due to the reasons that Kunun zaki and Kunun aya undergoes milling, and fermentation process which lower the value of the phytate, this is in agreement with the result of (Samtiya et al., 2020) who stated that: milling, soaking and fermentation technique removes anti-nutrients (e.g. phytic acid and tannins), which are present in the bran of grains.

From the table the phytate content of local tamarind drinks were 3.78 which is higher than the phytate content of Tamarind Seed nut as reported by (Akajiaku et al., 2014). The oxalate content of all the beverages ranged from 0.49 – 0.95. This shows significant difference between kunun zaki and the other samples. The tannin content of all the samples ranged from 0.22 – 1.07 with Zobo having the highest value. Significant difference exist ($p \geq 0.05$) between zobo and Kunun zaki but no significant difference ($p \geq 0.05$) between kunun Aya and local tamarind. Pre-processing treatment of the seeds show reduction in oxalate content. Previous studies have also shown that processing techniques such as cooking, dehulling, soaking, fermentation and germination, improves the nutritional quality of food products by reducing or eliminating the anti- nutrient

composition of the food product. (Samtiya *et al.*, 2020) also confirmed that, anti-nutritional factors, which reduce the nutritional value of foods can be reduced by the use of traditional food preparation methods such as fermentation, cooking, soaking and puffing.

Table 4: Shows the Antioxidants properties and capacity of the beverages. Antioxidants are substances or compounds that have free radical scavenging capacity while inhibiting oxidative progression (Rahaman et al.) 2020). According to the finding described by (Flieger et al., 2021) which stated that; Antioxidants act by delaying or preventing the oxidation of other chemicals. The flavonoid and phenolic content was highest in zobo drink with a value of 0.44±0.00 mg/ml and 18.95±2.41 respectively. Kunun Zaki and Kunun Aya has the Flavonoid and total phenol content of 0.16±0.00, 9.59±0.06 and of 0.13±0.01, 8.30±0.29 respectively from the table it was observed that local tamarind drink has the lowest flavonoid and total phenol content of 0.07±0.00, 5.28±0.89 respectively. There was a significant difference ($p \geq 0.05$) between the samples except the total phenol content of Kunun Zaki and Kunun Aya which shows no significant difference ($p \geq 0.05$).

There were a lot of literatures that provides ample data to support the antioxidant capacity of beverages. The health benefit of locally produced beverages are mainly attributed to the presence of bioactive compounds such as polyphenols (Nowak and Gośliński, 2020). A research by (Oboh and Okhai, 2012), confirmed the high phenolic and flavonoid content of zobo Drinks, with 16.81 ± 0.26 mg/ml and 3.91 ± 0.22 mg/ml respectively. another research by (Wong et al., 2002) also shows high flavonoid content of Zobo drinks and confirmed the correlation of its content with highest antioxidant scavenging capability. The high content of flavonoids in zobo drink is responsible for the high antioxidant content of the drinks (Wong et al., 2002).

From the table, the antioxidant capacity of the Drinks; the ABTS and DPPH shows that ‘zobo’ drinks had the highest antioxidant scavenging capability which followed by Kunun zaki as measured by DPPH and ABTS. The result also showed that there was a significant difference among the samples of locally produced beverages in all the assays. ABTS and DPPH free radical scavenging abilities follow the same trend. Kunun zaki drink ranked closely after zobo for DPPH and ABTS. Local tamarind drinks was significantly lower in DPPH and

ABTS scavenging ability than Kunun aya. This indicates that local tamarind drink had the lowest ability to scavenge DPPH and ABTS radical.

Table 3: ANTI NUTRITIONAL CONTENT

Parameters	Phytate (mg/g)	Oxalate (mg/g)	Tannin (mg/g)
Zobo	10.30±0.58^{a}	0.49±0.64^{c}	1.07±0.01^{a}
Kunun zaki	5.36±0.58^{b}	0.95±0.64^{a}	0.22±0.01^{c}
kunun aya	4.944±0.00^{bc}	0.63±0.00^{bc}	0.35±0.01^{b}
Local tamarind	3.708±0.58^{c}	0.77±0.64^{b}	0.37±0.01^{b}

Values are Mean of triplicate determination ± S.D Different superscripts on the same row are significantly different ($p \leq 0.05$) according to Duncan Multiply range test.

Table 4: ANTI OXIDANT CONTENT OF THE SAMPLES

Parameters	Flavonoid (mg/g)	Total phenol (mg/g)	ABTS (mMol/g)	DPPH (%)
Zobo	0.44±0.00^{a}	18.95±2.41^{a}	0.26±0.00^{a}	34.22±0.08^{a}
Kunun zaki	0.16±0.008^{b}	9.59±0.06^{b}	0.10±0.00^{b}	21.06±0.82^{b}
kunun aya	0.13±0.01^{c}	8.30±0.29^{bc}	0.01±0.0002^{c}	15.96±1.99^{c}
Local tamarind	0.07±0.00^{d}	5.28±0.89^{c}	0.007±0.00^{d}	3.52±0.00^{d}

Values are Mean of triplicate determination ± S.D Different superscripts on the same row are significantly different ($p \leq 0.05$) according to Duncan Multiply range test.

Conclusion.

The results of this study showed that the microbial load of *locally produced beverages (Zobo drinks, Kunun Zaki, Kunun Aya and Tamarind) sold within sabon Gari Market of Kano state Nigeria* is high due to possible use of contaminated water during its production and or improper handling methods. Moreover the antioxidant scavenging capability of the samples was observed. . The high acidic content of local tamarind dinks could be responsible for its high antimicrobial activities. The findings from this work revealed that the bioavailability of the various nutrients of the drinks will be present due to its low anti nutritional content. This study exposes the beneficial potential of locally produced beverages; hence, there is a need to improve on the hygienic methods of processing of these drinks.

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