

Nutritional and Sensory Qualities of Kunu-Zaki (A Non-alcoholic Local Beverage) Produced from Sorghum and Date Fruit

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Abstract

The nutritional and sensory qualities of kunu – zaki produced from sorghum and date Fruit flour (*Phoenix dactylifera*) was investigated, the sorghum and date fruit was prepared in the ratio of (100%), (90:10%), (80:20%), (70:30%), and (60:40%). These products were analyzed for proximate composition, mineral and sensory qualities using standard method. The values obtained shows that there was significant increase ($P \leq 0.05$) in protein, ranging from 4.21 ± 0.03 to 4.86 ± 0.01 , fibre ranges from 0.79 ± 0.05 to 1.2 ± 0 , fat ranges from 0.35 ± 0.01 to 0.37 ± 0.01 , and the carbohydrate content ranges from 10.25 ± 0.02 to 13.57 ± 0.03 . There was decrease in the moisture content ranging from 82.08 ± 0.04 to 78.9 ± 0.04 and ash ranging from 1.92 ± 0.02 to 1.71 ± 0.02 . The minerals analysis shows an increase with increase fortification of date fruit with calcium ranging from 12.4 ± 0.0 to 19.3 ± 0 , Iron ranges from 12.12 ± 0.03 to 17.87 ± 0.01 , Magnesium ranges from 12.2 ± 0.14 to 14.3 ± 0.42 . The sensory qualities reveals there was significant difference ($p \leq 0.05$) among the samples and shows that the sample B (90:10%) was the most acceptable in terms of all the sensory attributes (taste, colour, flavor and overall acceptability). The study therefore suggest that production of kunu – zaki with sorghum and date fruit flour should be encouraged as it improves nutritional and sensory qualities.

Keyword

Kunu-zaki, Sorghum, Date Fruit, Nutritional, Sensory

1. Introduction

Kunnu-zaki is a popular traditional non-alcoholic fermented beverage consumed throughout Nigeria mostly in the Northern part of the country. It is usually made from grain such as millet or sorghum. Kunu-zaki made from sorghum is a milky light brown colour whilst that which is made from millet and maize is a light ash colour. [1]

Adeyemi and Umar [2] described the traditional process for the manufacture of kunnu-zaki as the process which involves the steeping of sorghum grains, wet milling with spices (ginger, cloves, and pepper) wet sieving, and partial gelatinization of the slurry, followed by the addition of sugar and bottling.

Sorghum (*Sorghum bicolor* L. Moench) is a gluten-free cereal grown in many African countries primarily as food crop with less than 5% of the annual production commercially processed

by the industry [3]. Therefore, many traditional processing techniques such as soaking, malting and fermentation reported to inhibit anti-nutrients in cereals, legumes, roots and tubers had been applied to sorghum [4]. Sorghum is a cereal crop grown for food and for animal feeds. Most sorghum is produced in Africa. Sorghum is also a member of a grass species and is grown in semi – arid region around the world. Sorghum is known as a high energy drought tolerant crop.

Kunu-zaki is often used as a weaning food beverage for infants in Nigeria. However, since the beverage is produced majorly from cereals, it could be deficient in nutritional quality, especially protein, vitamins and minerals, and hence supplementation with richer sources of nutrients may be required [5].

As a result of low nutritional value of this beverage, research efforts are required to ensure its improvement in Nutritional quality. A good approach could be exploitation of the Dates in complementing nutritional deficiency that is

associated with Kunnu – zaki. This study was therefore undertaken to incorporate Dates fruits into the beverage for possible Nutritional improvement.

Date (*Phoenix dactylifera*) has been known widely by the society that related to their life in the Middle East and the kingdom of Saudi Arabia. In most all arrears of this region, it is consider as part of the most people diet because of its benefits that are good for health. Date is generally consumed, either eaten immediately or in various types of food and beverages, such as cake, pancake, pie,, pudding, sauce, ice cream, date’s stew, syrup, jam, tea and have been ascribed to have many medicinal properties when consumed either alone or in combination with other herbs [6]. The date fruit contains high percentage of Carbohydrate with total sugars of about 44-88% and is known to be packed with an impressive list of essential nutrients, vitamins and minerals that are required for normal growth, development and overall well-being. In addition to being eaten out-of-hand, dates have been employed as natural sweetness and used in sweeten a variety of drinks. [7].

On the other hand, the date palm is useful to take care of eye, bones, teeth’s health, lung and cancer. In the terms of Nutritional value, it has 23 calorie, 9-13 of soluble fibre, 2.5-4.35% crude fibre, 1.4-1.7g/100g protein of date flesh (0.3-0.5% 100-800mg/100g wet weight, fatty acids and potassium amounted [8].

More Nigerians are abandoning popular carbonated drinks in the local place as ‘mineral’, for local more natural one’s like kunu, zobo, ginger and others. As a result of low nutritional value of this beverage, its nutritional quality can be improved by fortifying with date fruits in complementing nutritional deficiency that is associated with kunu zaki.

The proportion of water varies from 55.98%, the remainder being mostly additives. Kunu zaki is acidic in nature. This level of acidity of kunu zaki has been described by several researcher including Efiuvwevwere and Akoma [9] that attributed this to be presence of certain species of lactic acid bacteria namely, *Lactobacillus1 Leichminnu* and *Lactobacillus fermentum* during fermentation process. The consumption of these local made beverage is high due to high cost of non-alcoholic drink This research work investigated the effect of dates fruits on the Nutrient composition and sensory evaluation of the kunu-zaki products.

2. Materials and Method

2.1. Sample Collection and Preparation

Sorghum and Dates were purchased from the local market at Sayedero in Ilaro, Ogun State. Nigeria. Other ingredients were also purchased from the same market. The sand and other solid impurities were removed from the Sorghum and dates fruits.

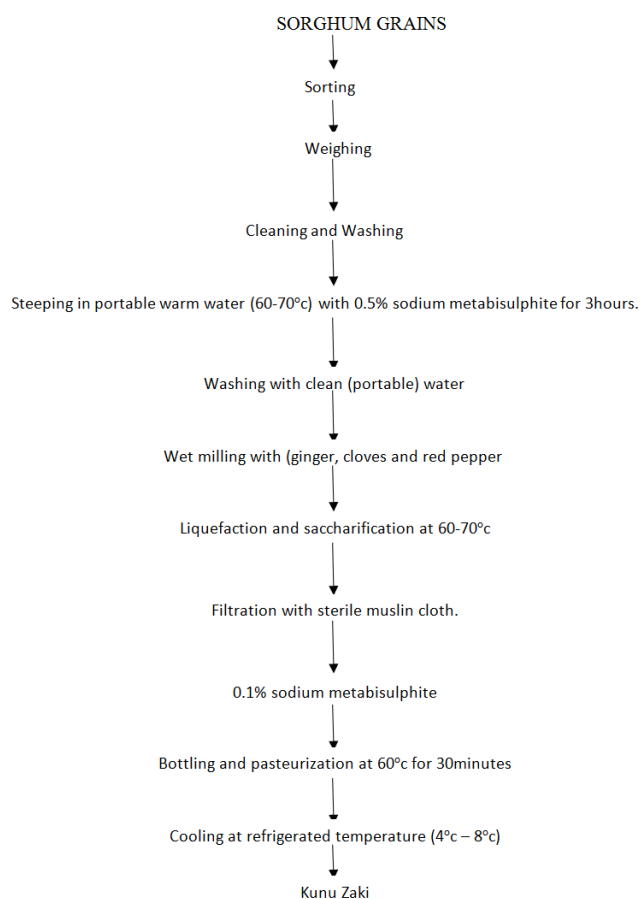
2.2. Preparation of Date Fruit Flour

2500grams of dates (*Phoenix dactylifera*) was weighed, washed with clean water to clear up residual dirt in the seed, it was then soaked into Natrium Bisulphite (NaHSO3) for 24hours to maintain the colour and prevent browning

reaction during warming process. It was then flush with portable water after soaking and it was boiled in water within 80 – 90°C for 10minutes to soften the texture of the date seed and it was drained under the sun, cabinet drier or oven dry for 24hours at 50 – 60°C. After drying, it was grinded and sieved to get smooth of flavor texture.

2.3. Production of Kunu Zaki Drink

Kunu Zaki drink was prepared by weighing sorghum grain using a manual weighing balance. The grain was steeped in warm water (at 30°C for 3hours) with the addition of 5% sodium metabisulphite, in order to softening the grains and reduce the microbial load that is present inside the grains and also as a preservative. Washing of the grain was done thoroughly to remove the dirt, dust, pesticide, residues and micro flora on the body of the grain, wet milled with addition of spices, (cloves, ginger, red pepper) and fortified with Date fruit flour (*Phoenix dactylifera*) in (10, 20, 30 and 40%) and was divided into unequal parts (1:4), the larger part (3:4) was gelatinized (by the addition of hot water), cooled to 40°C and add to ungelatinized portion, it was mix thoroughly, packaged and refrigerate ready for analysis as shown (Figure 1) [1].



Source: Gaffa et al, 2002 [1]

Figure 1. Flow chart for improved production of kunu-zaki beverage.

2.4. Proximate Analysis of Kunun Zaki

Protein, fat, ash, fibre and moisture were determined

following the procedure outlined by AOAC while the carbohydrate content was calculated by difference. [10]

2.5. Mineral Analysis

Calcium, Magnesium and Iron were analysed in all Kunu samples drink produced 5g of each sample were heated gently over a Bunsen burner flame until most of the organic matter was destroyed. This was further heated strongly in a muffle furnace for several hours until white – grey ash was obtained. The ash material was cooled. About 20ml of distilled water added to the ash material. This mixture was boiled, filtered into a 250ml volumetric flask, washed thoroughly with hot water. Cooled and made up to volume. Minerals content of each sample was analyzed using Spectrophotometric methods [11].

2.6. Sensory Evaluation

Ready to serve Kunu zaki drink (from Sorghum and date) were prepared from each samples 100%, 90:10, 80:20, 70:30,

60:40 and were presented to a panel of judges for sensory evaluation for colour, taste, flavor and overall acceptability using an 8 – point hedonic scale. The panel members were selected on the broad range of different attributes of kunu zaki [12].

2.7. Statistical Analysis

Data were subjected to variance analysis and differences between means were evaluated by Duncan's multiple range test using SPSS statistic programme, version 20.0. Significant differences were expressed at $P < 0.05$.

3. Results and Discussion

3.1. Result

The result of proximate analysis is shown in Table 1 while the mineral and sensory analysis are presented in Tables 2 and 3.

Table 1. Proximate composition of kunu zaki made from blends of sorghum and dates fruit (*Phoenix dactylifera*).

Sample	Moisture Content (%)	Protein (%)	Fat Content (%)	Crude fibre (%)	Ash content (%)	Carbohydrate (%)
A	82.08±0.04 ^c	4.21±0.03 ^a	0.35±0.01 ^a	0.79±0.05 ^a	1.92±0.02 ^c	10.25±0.02 ^a
B	81.34±0.15 ^d	4.39±0.07 ^b	0.36±0.02 ^a	0.94±0.04 ^b	1.82±0.01 ^d	10.92±0.04 ^b
C	79.29±0.03 ^c	4.86±0.01 ^c	0.34±0.01 ^a	1.06±0.02 ^c	1.75±0.01 ^c	12.65±0.09 ^c
D	79.06±0.07 ^b	4.87±0.01 ^d	0.35±0.01 ^a	1.17±0 ^d	1.74±0.01 ^b	13.04±0.11 ^d
E	78.9±0.04 ^a	4.86±0.01 ^d	0.137±0.01 ^a	1.2±0 ^e	1.71±0.02 ^a	13.57±0.03 ^c

Values represent mean and standard deviation. Means with the same superscript within a column are not significantly different ($p \leq 0.05$)

A-100% Sorghum

B-90% sorghum 10% dates fruit flour

C-80% sorghum 20% dates fruit flour

D-70% sorghum 30% dates fruit flour

E-60% sorghum 40% dates fruit flour

Table 2. Mineral composition of kunu zaki made from blends of sorghum and dates fruit (*Phoenix dactylifera*).

Sample	Calcium (g/100g)	Iron (mg/100g)	Magnesium (g/100g)
A	12.4±0 ^a	12.12±0.03 ^a	12.2±0.14 ^a
B	14.4±0 ^b	14.57±0.59 ^b	13.15±0.07 ^b
C	15.5±0.70 ^c	15.39±0.36 ^c	13.55±0.21 ^c
D	17.55±0.2 ^d	16.25±0.12 ^d	13.75±0.07 ^d
E	19.3±0 ^c	17.87±0.01 ^c	14.3±0.42 ^c

Values represent mean and standard deviation, Means with the same superscript within a column are not significantly different ($p \leq 0.05$)

Table 3. Sensory Analysis of kunu zaki made from blends of sorghum and dates fruit flour (*Phoenix dactylifera*)

PARAMETERS	SAMPLES				
	A	B	C	D	E
Taste	8.00±0.04 ^a	8.80±0.11 ^b	7.10±0.03 ^a	7.40±0.01 ^d	6.70±0.02 ^d
Colour	7.90±0.07 ^b	8.00±0.13 ^c	7.40±0.02 ^a	6.50±0.01 ^c	6.50±0.03 ^c
Flavour	7.90±0.03 ^b	8.30±0.001 ^c	6.90±0.05 ^b	7.10±0.02 ^b	6.90±0.01 ^b
Overall acceptability	8.50±0.13 ^b	8.80±0.05 ^a	7.70±0.02 ^a	7.80±0.02 ^a	7.10±0.01 ^a

Means with the same superscript within the a row are not significantly different ($p \leq 0.05$)

3.2. Discussion

The proximate composition of Kunu-zaki made from blends of Sorghum and Date fruits flour were presented in table 1. The result shows that the moisture, protein, fibre, ash and carbohydrate content of the kunu are significantly

different ($p < 0.05$) with values that ranged from 78.9 to 82.08%, 4.21 to 4.86%, 0.79 to 1.2%, 1.71 to 1.92% and 10.25 to 13.57%, respectively. It was observed that as the percentage inclusion of date's fruit increases the protein increases in which sample A had the lowest while E had the highest content. This was in agreement with work of Ofudje *et al.* [13] who supplement kunu-zaki prepare from maize,

millet and guinea corn with powder milk. As the percentage of date fruit increases, the ash and moisture content decreases in which sample E had the lowest while sample A had the highest content. The fat content of the kunu-zaki made from sorghum and dates fruits are not significantly different ($p \geq 0.05$) with values that ranged from 0.34 to 0.37 in which sample C had the lowest while sample E had the highest.

Moisture content is a good parameter for food spoilage and acceptability, the moisture content of kunu decreased with inclusion of date fruit which can be attributed to the low moisture of the date seed results are similar to the study done by El-Sohaimy and Hafez [14]. The increase in protein of the kunu as percentage inclusion of date fruit increases can be attributed to the protein content of the date fruit. Ash content is an index to the nutritive value of foods and the values obtained in this study are within the report of El-Sohaimy and Hafez [14] Although dates are not a good source of protein [15] but the protein content of dates fruits are much higher than sorghum. Therefore, it may contribute to the human diet with high quality of some essential amino acids. The data obtained are in close agreement with those values already reported by Gamal A. El-Sharnouby et al. [16]. The increase in carbohydrate and crude fibre are expected because of the high carbohydrate and crude fibre in date seed. In the report of Sultana et al. [17], Dates are high in carbohydrate content ranging from 77.31%- 88.02% serving of the fruit for Tunisian cultivar, where Trunja 83.95%, Lagou 77.31% and Gounda 84.79% [18]. The aforementioned authors analyzed ten date cultivars grown in the Saudi Arabia and found 68.2-78.3% reducing sugar and 2.9-5.1% non-reducing sugar [19]. The sugar in dates are easily digested and can immediately be moved to the blood after consumption and can quickly be metabolized to release energy for various cellular activities [15]. It has been reported that dates are high source of energy as 100 g of flesh can provide average of 314 Kcal [20]. Some of which are used for industrial purposes, have been found to contain up to 10% of crude fiber [21]. Report from researchers show that the crude fiber of dates ranged from 4.4-6.5% [22]. High fiber containing food is essential for preventing constipation, Cancer and Diabetes mellitus.

Mineral composition of kunu made from blends of sorghum and dates fruit is presented in Table 2. The calcium, iron and magnesium of kunu made blends of sorghum and dates fruit are significantly different ($p < 0.05$) with values that ranged from 12.4 to 19.3 g/100g, 12.12 to 17.87 mg/100g and 12.2 to 14.3 g/100g, respectively. It was observed that as the percentage inclusion of Dates fruit increases in the kunu the mineral composition increases. The increase in mineral composition in kunu could be attributed to the high mineral elements in Dates fruits. Mineral elements are biochemically essential in diet for such functions as bone formation, strong teeth development and digestion aids, enzyme stabilizers as well as transport cofactors in metabolic pathway [23].

Sensory properties of Kunu zaki samples is presented in

Table 3, the values obtained are 8.00 ± 0.04^a , 7.90 ± 0.07^b , 7.90 ± 0.03^b , 8.50 ± 0.13^b and 6.70 ± 0.02^b , 6.50 ± 0.05^a , 6.90 ± 0.01^a , 7.10 ± 0.01^a for taste, colour, flavor and overall acceptability of sample PES and KAN respectively. The samples are significantly different in terms of taste, colour, flavor and overall acceptability. Sample B (90 – 10%) has the highest value for the organoleptic properties when compared with other samples. Hence Sample B is the highly accepted drink of all the kunu – zaki drinks produced in terms of overall acceptability.

4. Conclusion

In conclusion, the percentage inclusion of date seeds to sorghum for kunu production significantly affected the proximate and mineral composition of the kunu samples. The higher the percentage inclusion of date fruit the higher the nutrients. Sensory evaluation shows significant difference in in terms of taste, colour, flavor and overall acceptability. Sample B had the best overall acceptability

5. Recommendation

More research work should be carried out on the microbial and physicochemical analysis of kunu Zaki drink produced from sorghum and dates fruit.

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