



Evaluation of Tiger Nut Milk as a Nutritious and Refreshing Drink among Various Age Groups

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Abstract

Tiger nut milk is vegetative milk that can serve as a good substitute for animal milk, especially with people having lactose intolerance. This research was carried out in Ede township involving both Ede North and Ede South Local Government areas of Osun State, Nigeria. The nutritional and health properties of the nuts were assessed showing that the milk was rich in calcium, magnesium, phosphorous, potassium, iron, vitamins B₁, C and vitamin E, protein (Arginine amino acid) and fatty acids (palmitic, stearic, oleic and linoleic). Acceptability of the product was carried out through sensory evaluation (organoleptic test) using a seven point hedonic scale. Tiger nut Milk was appraised by eighty six (86) respondents comprising different age groups. Data were analyzed using frequencies, percentages and analysis of variance (ANOVA). The result showed that there was no significant difference in the response of the respondents as to acceptability of tiger nut milk except for texture where few were indifferent. It can be concluded that the milk product was acceptable nutritionally and with health benefits for promoting normal menstruation, sexual and heart stimulation, healing stomach pain, use as liver tonic and for healing mouth and gum ulcers. Awareness and cultivation of tiger nut should be given publicity to enhance its utilization and intensification of findings into its milk derivative should be encouraged.

Keywords: Tiger Nut, Tuber, Underground walnut, Underutilized

Introduction

Background to the Study

Tiger Nut (*Cyperus esculentus*) belongs to the family of Cyperaceae, the rhizomes are produced from the base within six inches from the ground surface and tubers are spherical in shape. It is produced by wind pollination, the tuber membrane is white when young and yellow when old (Bamishaye, 2011). They are tuber vegetables similar to those of potatoes. It is an ancient food and one of the earliest domesticated crops. It was found in Egypt in 400BC, later to Spain but now the tubers are available everywhere especially in the North Central and South America and Africa especially Ghana, Nigeria and Sierra Leone. It is available in Nigeria all-round the year but usually cultivated in the Northern Nigeria around April and harvested in November. Nutritionally, Tiger Nut is high in energy content-starch, fats, sugars, proteins- dietary fibre and minerals like phosphorous, potassium, calcium, sodium, magnesium, zinc, and traces of copper and vitamins E and C (Bazine and Arslanoğlu, 2020)

Tiger nuts (*Cyperus esculentus* L.) is a tuber, underground walnut widely grown all over the world called Zulu nut, yellow nuts grass, ground almond chufa, rushnut, yellow nutsedge, and earth almond. In Nigeria, among the Yorubas' it is called 'Imumu', Hausa calls it Aya, and Igbo, Ofio. (Bazine and Arslanoğlu 2020). It is used as livestock feeds and for human consumption. It supplies essential nutrients at a widely very low cost. It can be eaten raw, dried, roasted or grated and can be processed further to milk, in place of cow milk, used as baking flour and fish baits (Adejuyitan, *et al.*, 2009). Tiger nuts has great nutritional and health benefits - rich in both macronutrients, micronutrients (minerals and vitamins-), antioxidants and reduces the risk of cancer and prevents constipation, assist in fertility, delay cells aging and prevents skin alteration. (Anna Okon, 2019). The milk extracted from Tiger nut is referred to as Tiger nut Milk and nutritious mirroring human milk. There is more scientific and technological interest in Tiger nut but higher interest is developing in the production of Tiger nut milk and its oil (Sanchez-Zapata, *et al.*, 2012). In the



study carried out by Rita (2019), in which a comparative assessment of acceptability of Tiger Nuts Milk, it was noted that the general acceptability of the products varied between 90% and 98% of the panelists. This showed that the beverage was very acceptable although there was a slight preference for the roasted tiger nut beverage.

Statement of the Problem

Many people are not aware of the importance and benefits that can be derived from tiger nuts; those eating tiger nuts do so unaware of the nutritional benefits thereof. The food derivatives obtained from Tiger Nuts like milk and oil are underutilized. Several studies on the derivation of alternative uses to raw consumption have been accompanied with the evaluation of nutrient content of the nuts. Few studies have focused on the milk derivative and the offals. The acceptability of the product to consumers across age groups has not been common. This study is intended to create awareness of the offerings of Tiger Nuts and the derivatives especially the milk and raise the interest in people to consuming Tiger Nut in view of the nutritional benefit of Tiger Nuts.

Objectives of the Study

The general objective of the study is to evaluate the nutritional value of Tiger Nut milk and evaluate its acceptability among various age groups.

The specific objectives of this study are:

1. Assess the nutritional properties of tiger nut milk
2. Develop a recipe and produce tiger nut milk
3. Perform a sensory analysis (colour, flavor, taste) and evaluate the overall acceptability of the tiger nut milk.

Significance of the Study

This study will create an awareness of the nutritional and health benefits of Tiger nut milk as a derivative of Tiger nuts as distinct from the eating of raw nuts. The study will examining the acceptability of the product provides information to help in furthering research on market potentials and commercial production of the milk. This work has significant contribution to households in the adoption of the product for commercial consideration.

Tiger nut milk as substitute for cow milk can be used in the production of yoghurt, serve as nutritious milk. Health authorities may find this work interesting as it is costs effective towards utilization. The cultivation of Tiger nuts will be encouraged through this research outcome.

Tiger nut botany and production

Tiger nut is an ancient food that originated from Africa but currently cultivated in Spain, West Africa and other parts of the world. They are tubers of a grass-like plant called the *yellow nuts edge* and are not actually nuts, however its chemical composition shares characteristics with both tubers and nuts. It is an annual or perennial plant growing to 3 ft tall with solitary stems growing from a tuber. The tubers are 0.3cm – 1.9cm in diameter and the colour varies between yellow, brown and black. Its cultivation requires a mild climate; tiger nuts grow on sandy moist soil at a pit of 5.0 – 7.5 cm. The planting is done on flat soils with ridges to favors irrigation. About 60 cm gap between the ridges and 15 – 20cm between the seeds and 8cm depth. Seedling rate is about 120kg tubers per and the harvest is done around November or December. Drying is done in the sun up to three months (Tiger Nuts Traders, 2012).

The nut is available in the market all-round the year in the Northern Nigeria and the weight of fresh tuber is between 70mg to about 900mg while the weight of dried tuber is between 30mg to 350mg. A dried tuber nut can absorb up to three times its own weight of water. Derivatives of Tiger Nuts are Tiger nuts milk Tiger nut oil, their nutritional value arises from the very composition of the tiger nut (Bamishaiye, 2011).

Uses of Tiger Nuts

Tiger nuts tubers are used as food, they are hard with slightly sweet taste and nutty flavor. They are eaten as snack in West Africa, Spain as Horchata non-alcoholic beverage of milky appearance, used as composite flour with wheat flour for bakery products; also used in Yoghurt and beer production. (Yali Yu, *et al.*, 2022). It is used as a flavouring agent in ice- cream and in Nigeria for preparation of Kunnu (Belewu *et al.*, 2008). Tiger nut milk serves as an alternative source of milk in fermented products in production of yoghurt and replace milk in people with intolerance to lactose diet

Tiger nuts can cause rectal impaction when about 300 gm of dehydrated nuts is taken



without being hydrated. The nut helps to prevent cardiovascular disease; in preventing the risk of cancer and heart diseases. It aids digestion: the presence of potassium (25 tiger nuts gives 139mg of Potassium) helps the cell and organs to work correctly, regulates the muscle contractions which helps digestion. The fibre content of tiger nuts helps to regulate the blood sugar level and control diabetes. Tiger nut

Nutritional Benefits of Tiger Nuts Milk (Horchata)

Tiger nut milk is richer than oats, bran or cabbage in calcium, magnesium, phosphorous, potassium, iron, vitamin B1, vitamin C, vitamin E, protein (Arginine amino acid) and fatty acids (palmitic, stearic, oleic and linoleic) (<http://dailysuperfoodlove.com/4325/tiger-nut-milk-the-fantastic-bene..>). Tiger nuts milk is a vegetative milk produce from tiger nut seed and a perfect substitute of animal milk (Edo *et al.*, 2023). It contains unsaturated fat i.e. vegetable

Materials and Methods

The study was carried out in Ede Township and its suburbs covering Ede North and Ede South Local Government Areas of Osun, State. Tiger nut was bought at Oje Market in Ede North Local Government Area. The Tiger Nuts were processed into milk. Various age groups (from 6

has protein content of 8% more than whole wheat meal and more amino acids than WHO recommended standard for protein health. It helps in maintaining a healthy body weight. Tiger nuts have high fiber content that helps to prevent constipation and acts as an appetite suppressant which helps to control body weight. (Ogunlade, *et al.*, 2015)

fat which is considered the best for human consumption. About 13- 17% of daily recommended intake of Magnesium is contained in 100g of Tiger nuts which helps biochemical reactions in the human body. It improves blood flow which helps to control blood pressure.

In China, its milk is used for health purpose as tonic for the liver, heart stimulant, it is also drunk to cure serious stomach pain, improve menstruation, heal mouth and gum ulcers and a powerful sexual stimulant (Bazine and Arslanoğlu, 2020)

years, up) were sampled and the product was served to them for assessment.

Nutritional properties determination: The nutritional composition of Tiger Nuts was obtained from literature and the essential nutrients highlighted to show its comparative advantage over other milks.

Recipe and Production of Tiger Nut Milk

Tiger nut milk was produced using the ingredients listed below:

Recipe	Quantity
Fresh tiger nut	500g
Coconut	few slices
Ginger	2bulbs
Preservative	2 teaspoons
Milk Flavour	1 teaspoon
Sugar	2teaspoons

Method for the Production of Tiger nut Milk

Tiger nut were sorted- stones and other unwanted elements were removed. They were subsequently washed thoroughly in clean water by rubbing the nuts between the hands and rinse with clean water. It was then soaked for twenty four (24) hours until softened.

The Tiger nut, soaking water, ginger, and coconut were transferred into the food processor for grinding in ground to form a smooth paste with added water. It was later sieved with a mesh strainer into a bowl, sugar and flavour were added. The mixture is kept shaken up until a full consistent product is obtained and the milk was refrigerated.

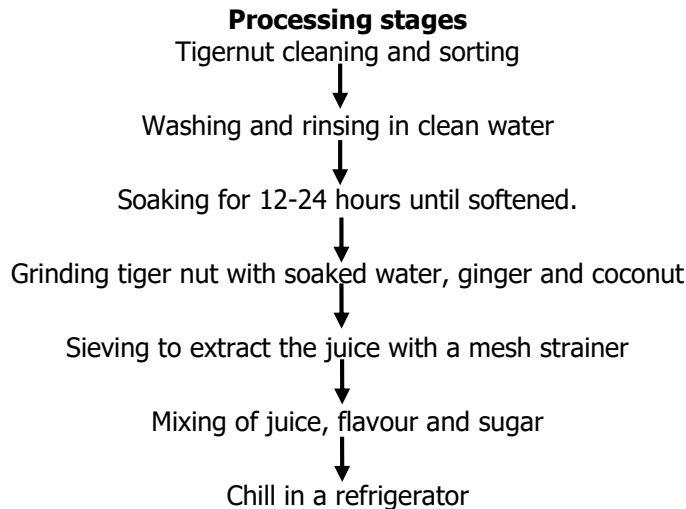


Fig. 1 Flow Chart showing Tiger Nut Milk Processing
(Source: Author's Process Flowchart, 2024)

Result and Discussions

Acceptability of Tiger Nuts Milk: Tiger Nuts Milk was served to a panel of eighty- six persons who showed interest in participating in the experiment on a market day in Ede town. This cuts across age groups with minimum age set at six years and no maximum. The class boundaries were 6-11 years, 12-18 years, 19-40 years, 41-60 years and 60 years and above. The level of acceptability of Tiger Nuts Milk was assessed using a seven point hedonic scale which scores 7 for "strongly like," 6 for "like," 5 for "moderately like," 4 for "Indifferent," 3 for "moderately dislike," 2 for "dislike," and 1 for "strongly dislike." The scores were tabulated according to age classification to show the level of acceptability among various age groups.

Inferential: the various evaluation parameters were subjected to analysis of variance (ANOVA) test to determine the degree of difference in opinions of the panel.

Result and Discussions

The chemical properties of Tiger nuts had been analyzed and much of the findings are similar to the work of Oladele and Aina, (2007) findings. Table 1 shows the Nutritional contents of Tiger Nuts, especially the micronutrients. It depicts the two common types of Tiger Nuts with the yellow variety having more calcium, sodium and copper, while brown variety is richer in potassium, Magnesium, Manganese and iron. The two varieties had equal contents of phosphorus and zinc.

Table 1 Nutritional Properties of Tiger Nuts

Mineral element	Yellow variety	Brown variety
Calcium	155.00	140.00
Sodium	245.00	235.00
Potassium	216.00	255.00
Magnesium	51.20	56.30
Manganese	33.20	38.41
Phosphorus	121.00	121.00
Iron	0.65	0.80
Zinc	0.01	0.01
Copper	0.02	0.01

Source: Oladele and Aina, (2007).



Overall acceptability of Milk produced from Tiger nut

In assessing the acceptability of Tiger Nut Milk, its sensory properties such as taste, colour, texture, appearance and flavor were featured for evaluation across age groups.

Age of Respondents: The age brackets covered by the survey were age 6 to 11 years; 12 to 18 years; 19 to 40 years; 41 to 60 years; and, above 60 years. About 28% of respondents were above 40 years of age. This was made up of 14% (41-60 year-old) and 14% (Above 60 year-old). Children in the 6 to 11 age brackets were 17.4 % while those between 12 and 18 years were 10.4%. The respondents in the 19 to 40 years bracket were 44.2%. The results is skewed in favors of children and youths below the age of forty as this is the class of respondents most inclined to consuming milk in any form.

Sensory Evaluation of Tiger Nut Milk

The sensory evaluation of Tiger nut milk was carried out by various age groups using taste, colour, flavor, texture, appearance and overall acceptability to show the perceptions across age groups.

Taste: Table 2 showed that 72 respondents (83.72%) either liked or strongly liked the product of this number 42 or 49 % strongly liked the product. There was no dislike across age groups. 14 respondents (16%) were indifferent and these were from 19 to 40 years age bracket. The analysis of the likes showed that age 6-11 years expressed 6 like and 12 strongly like, while all 8 respondents in 12-18 years old bracket strongly like, age 19 to 40 years old bracket expressed 14 indifferent, 14 like and 6 strongly like. Respondents in the 41-60 years showed 10 like and 10 strongly like. All respondents above 60 years strongly like.

Table 2: Response on taste of tiger nut milk as a nutritious and refreshing drink among various age groups

AGE	Indifferent	Like	Strongly like	Total
6-11	0	6	12	18
12- 18	0	0	8	8
19- 40	14	14	6	34
41-60	0	10	10	20
60 and above	0	0	6	6
total	14	30	42	86

Colour: Respondents perception of the colour of the product across age groups (table 4) showed that there was no dislike on the colour. All respondents either like or strongly like the product's colour. 66 of the respondents (76.7%) strongly like while the rest 20 (23.3%) like it.

Age 6-11 years -old bracket had all 18 like; age 12-18 had 4 like and 3 strongly like; age 19-40 had 6 like and 28 strongly like. All 6 respondents in the 60 and above age bracket group strongly like the colour of the product.

Table 3: response on colour of tiger nut milk as a nutritious and refreshing drink among various age groups

AGE	Like	Strongly like	Total
6-11	0	18	18
12- 18	4	4	8
19- 40	6	28	34
41-60	10	10	20
60 and above	0	6	6
Total	20	66	86

Texture: From table 4, all the 18 respondents between ages 6 and 11 years like the texture of the product, while 4 of the respondents each

either moderately like or strongly like the product's texture among the 12 to 18 years respondents. The respondents between 19-40



years of age had 8 moderately like, 6 like and 20 strongly like while age 41-60 years bracket had 10 moderately like, 2 like and 8 strongly like. From the result, all the 6 respondents that

were 60 years and above strongly like the product's texture. There was no dislike or indifference among the respondents.

Table 4: Response on texture of tiger nut milk as a nutritious and refreshing drink among various age groups

AGE	Moderately like	Like	Strongly like	Total
6-11	0	18	0	18
12- 18	4	0	4	8
19- 40	8	6	20	34
41-60	10	2	8	20
60 and above	0	0	6	6
total	22	20	38	86

Flavour: From table 5, four respondents from the ages 12-18 years bracket and six from 41-60 years - old were indifferent, while 12, 14 and 8 respondents between the ages 12-18 years bracket moderately like, like and strongly like the product's flavour respectively. Age 41-60years had 4 moderately and 19 strongly like, while all the 6 respondents from 60years and above age bracket strongly like the product's flavour.

Table 5: RESPONSE ON FLAOUR OF TIGER NUT MILK AS A NUTRITIOUS AND REFRESHING DRINK AMONG VARIOUS AGE GROUPS

AGE	INDIFFERENT	MODERATELY LIKE	LIKE	STRONGLY LIKE	TOTAL
6 -11	0	0	0	18	18
12-18	4	0	0	4	8
19-40	0	12	14	8	34
41-60	6	4	0	10	20
Total	10	16	14	46	86

Appearance: From table 6, there was no dislike or indifference, all respondents in the 6-11years (18), 41-60 years (20) and above 60 years (6) brackets strongly like the product's appearance while 4 and 22 respondents of ages 12-18 and 19-40 years bracket like the product's appearance. 4 and 12 respondents of ages 12-18 and 19-40 years strongly like the product's appearance.

Table 6: Appearance on flaour of tiger nut milk as a nutritious and refreshing drink among various age groups

AGE	Like	Strongly like	Total
6-11	0	18	18
12- 18	4	4	8
19- 40	22	12	34
41-60	0	20	20
60 and above	0	6	6
Total	26	60	86

Overall Acceptability: From the result, only 41-60 years had 6 indifferent respondents and 10 respondents of the 19-40 years bracket like the product. 70 respondents (or 81%) affirmed that they strongly like the product overall. All respondents of 6-11 years (18), 12-18 years (8) and above 60 years (6) brackets, and 24 and 14

respondents of 19-40 years and 41-60 years respectively strongly like the product overall. To assess the significance of the difference in the sensory panels of Tiger nut milk the Analysis of Variance was done and was statistical significant. There is no significant difference in the panel of acceptance of the tiger nut milk by taste,



colour, texture, flavour, appearance and overall acceptability as shown by the F values at 5% level of significance. Although, there was significant difference in the perception of texture ($p = 242$, $p > 0.05$), this might be due to the fineness of the mesh in the production.

Discussion of Findings

The test of acceptability of Tiger Nut Milk produced results that is similar to that of Rita (2009) in which the general acceptability of milk from Tiger Nut Milk varied between 90% and 98% for non-roasted and roasted tiger Nuts Milk. In this study, the Tiger Nut Milk was generally accepted across age-groups by over 93% of respondents who either strongly or moderately accepted the product overall. This corroborated the claim that Tiger Nut Milk is widely accepted and nutritious.

Conclusion and recommendations

The nutrition and health benefit of Tiger nut and its milk were well revealed by many Scholars'. Tiger Nut benefit had not been fully exploited and many people still fail to realize its nutritional and health benefits. In the evaluation of its milk, different age group were involved in the sensory evaluation and was highly acceptable except in the texture that many people were in different. It is recommended that the level of awareness of tiger nut and its milk as a nutritious and refreshing vegetable milk should be increased and given wide publicity. More research on Tiger nut and its products should be encouraged and process at commercial scale for more refinements.

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