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## RESEARCH ARTICLE

### UTILISATION OF TIGER NUT MILK IN THE PRODUCTION OF CAKE

\*Adam Issah

Department of Hospitaluty and Tourism Management, Faculty of Applied Science and Technology,  
Tamale Technical University

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#### ABSTRACT

**Introduction:** Antibiotics are among the commonly prescribed drug in the hospital settings. Dentists prescribe antibiotics therapeutically and prophylactically to manage dental and oral infections. Antimicrobial resistance (AMR) was recently stated by the World Health Organization to be one of the greatest threats to human health. Rate of antimicrobial resistance are growing worldwide, threatening public health and increasing morbidity, mortality and healthcare costs. Thus there is need to understand the perception, knowledge and attitude about antibiotics misuse, antibiotics resistance and its causes amongst the budding doctors and various specialists. **Aim:** With this background the aim of the study is to assess the perception, knowledge and attitude about antibiotics misuse, antibiotics resistance and its causes amongst the budding doctors and various specialists. **Method:** A cross-sectional survey was conducted using a self-administered questionnaire, amongst oral health care professionals, on the correct knowledge, attitude and practice about the usage of antibiotics. **Result:** When the results were compared it was found that the P-value was statistically significant when the practice and attitude of the dental professionals was compared whereas it was statistically not significant for the knowledge of dental professionals. **Conclusion:** We found poor attitude, knowledge and practice regarding antimicrobial use in dentistry thereby increasing the risk of antimicrobial resistance.

**Key words:** Issah Adam, Salifu Amina and Alhassan Nashira.

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#### INTRODUCTION

Tiger nut (*Cyperus esculentus L.*) is a member of the Cyperaceae family, usually not regarded as a nut but a tuber crop. Among its names are "chufa", Zulu nuts and yellow nut sedge (Rubert *et al.*, 2011). In Ghana Ga's call it "atangme," "atadwe" by the Akans, and "nansa" by Dagbamba. Widely, tiger nut is cultivated across several continents including Africa, Asia and Europe are known to be continents that have extensively engaged in the production of tiger nut for years because of its food value and commercial importance (Yeboah *et al.*, 2011). In Spain, where a well-developed industry exists, it has witnessed continuous growth with records showing yields ranging between 15,000 to 20,000 kilograms per hectare (Tiger nuts Traders, S.L., 2010). According to CRDO, (2012), about 5.3 million kilograms of tiger nut tubers valued at approximately 5 million Euros was produced in the Valencia region in Spain in 2009. In the account of Arranz *et al.*, (2006), Ghana, Nigeria, Niger and Mali are some of the West African countries that cultivate, process, distribute and sell the crop. In Ghana, the crop can grow well in most parts, (Dakogre, 2008).

\*Corresponding author: Adam Issah,

Department of Hospitaluty and Tourism Management, Faculty of Applied Science and Technology, Tamale Technical University.

It has been largely cultivated in the Eastern Region, particularly Kwahu Aduamoa as well as Bawjiase and its surrounding villages in the Central Region of Ghana (Nyarko *et al.*, 2011).

**Problem Statement:** The nutrient profile of tiger nut tubers have been reported by several research publications (Anyidoho, 2006), however, for many years it has been one of the underutilized food crops in Africa and in particular Ghana. In Ghana, documentation of a successful tiger nut food (product) is very little. It is less known to many as a very important food with much potential in managing, eliminating and preventing macronutrient and micronutrient deficiencies (malnutrition) or food insecurity problems. Adequate nutrition is essential for individual development, activity, good health, fulfillment function and success in societies and nations (ACC / SCN, 1991). All over the world it has been demonstrated that major nutritional problems could be solved through exploitation of the nutrient and economic potentials of local food resources of which tiger nut is no exception.

**Objectives:** The main objective of the study was to utilise tiger nut milk instead of animal milk in cake making.

**Specific objectives of the study were:**

- To develop a standard recipe for tiger nut milk cake

- To assess consumer acceptability of the tiger nut milk cake
- To package and observe shelf-life of the tiger nut milk cake

**Literature:** A study by Ahmed and Hussein (2014), have argued that tiger nuts cultivation originated in Egypt and their reason is that studies of ancient Egyptian artifacts have revealed the discovery of dry tiger nut tubers inside tombs in Egypt which dates back to 6,000 years ago as strong evidence that the cultivation of tiger nut started in Egypt. Back then in Egypt, roasted tiger nuts were used by the people as meats (Pérez-Alvarez 2012). A similar revelation by Udeozor and Awonorin (2014) is made that over thousands of years ago, the cultivation of tiger nut took place between Sudan and Egypt on the borders of the Nile River. In Southern Europe and West Africa, the cultivation of tiger nut had been practiced since early times. Tiger nuts have many functional properties; functionality according to Satin (2005) refers to the tiger nuts culinary roles in influencing organoleptic (quality) characteristics of food during food formulations; which functional properties will predict how the tiger nuts should be used in food formulations. Starch forms a significant proportion of the carbohydrates in tiger nuts and no other ingredient so far enhance the texture in as many food formulations as starch (Satin, 2005). Starch is a polymer, a giant molecule with two main constituent polymers amylose and amylopectin. Structurally, the amylose polymer has linear chain of glucose units joined to each other at  $\alpha(1-4)$  glycosic bonds whereas its counterpart polymer amylopectin is composed of a long straight chain of glucose units similarly joined to each as in amylose, but in addition, also having shorter chain branches along the main one at intervals of every 30 units. The bond between glucose units at these branch points is  $\alpha(1-6)$  glycosic (Gropper, Smith and Groff, 2005). Properties of any starch such as viscosity, gelatinisation, texture, solubility, tackiness, gel stability, cold swelling and retrogradation are each influenced by the proportion of the amylose and amylopectin in it. And starches from tiger nuts gelatinises more efficiently with minimal degree of tannin capable of having inhibitory effects on activities of amylases (Satin, 2005).

Nutritionally tiger nut tuber contains 7.0 % proteins, 58.0 % carbohydrates, and ash (minerals elements) 3.0 %, 10.0 % oil. Its oil is largely composed of oleic, linoleic, palmitic and stearic fatty acids. However, oleic acid the major component constitutes 61% of the total fatty acids contained in the nut (Kim *et al.*, 2007). In another study, Lattimer and Haub (2010) revealed that dietary fiber which is been found to be effective in the management and prevention of many non-communicable diseases is high in the tuber. These diseases include obesity, gastro intestinal disorders, coronary heart diseases, diabetes and colon cancer (Anderson *et al.*, 2009). Minerals such as phosphorus and calcium, which are important in the development and maintenance of bones and teeth, are also present in appreciable levels (Coskuner *et al.*, 2002). Owing to the rich nutrient profile of tiger nut, various studies have reported potential applications of tiger nuts in a number of consumer products made for the gastronomic, pharmaceutical or medicinal, confectioneries and the bio-fuel industries (Arafat *et al.*, 2009). In Ghana and in Spain, respectively a milk beverage called “atadwe” milk and “horchata de chufa” are popular commercial drinks produced from milled tiger nuts tubers in water, sieving and sweetened (Sanful, 2009). Tiger

nut milk is also reported to be high in starch, reducing sugars and low in fat; it also contains potassium and vitamins E and C (Tiger nuts Traders S.L., 2010); critical nutrients which boost the human immune system against diseases. It contains myristic, linolenic and large amounts of oleic acid (Belewu and Belewu, 2007). The use of tiger nut tubers and products in developing malt caramel, beverages, fermented foods and flour for baking has also been reported (Ukwuru *et al.*, 2011). Despite the aforementioned products, the variety of food products that we can derive from tiger nut tubers have yet to be exhausted. The high content of monounsaturated fatty acids (Oleic acid) makes tiger nut very helpful in metabolism and health (TTSL, 2005; Moore, 2004). Tiger nuts have a fat composition similar to olive oil and rich in minerals, especially phosphorus and potassium (Moore, 2004). Potassium in the human body as an electrolyte offsets the negative effects of high sodium in the system whereas phosphorus plays a vital role in protein synthesis, together; they help to enhance overall health. Tiger nut oil has a mild, pleasant flavour and is considered as food oil similar but superior in quality to olive oil. Moore (2004) tiger nut oil has high content of Vitamin E (alpha-tocopherol), and thus higher oxidative stability than other oils. Tiger nut tubers are rich in vitamin B1 which helps central nervous system to function properly and also help the human body undergo stressful condition. Regular consumption of tiger nut tubers improves men and women fertility as a result of vitamin E present in the tubers.

Vitamin E plays an antioxidant role and therefore protects the body from free radical attack which is vital for the maintenance of cell membranes. It improves the elastic property of the skin by slowing cellular ageing. It is particularly important in areas of the body exposed to oxidative stress such as the lungs and the red blood cells. As part of its antioxidant roles vitamin E may reduce the risk of cancer and coronary heart disease. Tiger nut oil has therapeutic properties that help reduce LDL cholesterol and increases HDL-cholesterol. Consumption of tiger nut oil can reduce levels of triglycerides in blood, reduce risk of formation of bloody clots, produce dilatation in veins and prevent arteriosclerosis. The oleic acid content of tiger nut oil enhance digestive secretions (gastric, pancreatic and bile) (TTSL, 2005). Tiger nut also has fiber content which is combined with its delicious taste. Since fiber stimulates digestive juices and contributes to a longer feeling of fullness which help speeds up digestion and also transit in the intestinal tract hence, dealing with constipation issues (TTSL, 2005).

Sensory evaluation is a ‘scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of foods and other materials as they are perceived by the senses of sight, smell, taste, touch and hearing’ (Institute of Food Technologists, 2014). Thus, it consists of measuring human sensory reactions to a product. It has the aim of testing to describe a product, its compliance and acceptability. It helps to know the characteristics of the physical matter of a product. Sensory evaluation includes measuring and analyzing the sight (appearance and color), smell (aroma), flavour, taste and overall acceptability of a product. It determines the organoleptic properties of the product, and the enjoyment of the products. Broadly, there are two types of sensory evaluation methods: *affective tests* in which consumer preference or acceptance of a product, in this case food, is assessed.

Acceptance test main interest is on actual utilisation/ purchase of a product. It attempts to measure the degree of potential consumers like or dislike for a particular product or the ability of the product to meet expectations of consumers. This test method is subjective and often involves human subjects who apart from assessing food products by their organoleptic features, they also heavily rely on their emotions. *Descriptive/ Analytical tests* have to do with analyzing specific product attributes in order to discriminate or find difference between two or more products; and description. It is also sometimes referred to as product oriented sensory analyses (Mason and Nottingham, 2002). When conducting affective sensory tests, an adequate sample size is required, usually around 75-150 individuals (Lawless and Heymann, 2010), or even larger; 100-500 individuals (Meilgaard *et al.*, 2007). The reason why the panel size in an affective test needs to be large is that individual preference has such a high variability. The preference of individuals can differ in many different ways, because of several different factors, e.g.: Personal background, experiences, culture, attitudes and habits. Personal interests, like interest in health, believe in different diets, interest in environment, practicing of sports etc. can also affect personal preference. All of these reasons affect each individual's preference regarding e.g. appearance, texture, smell and taste of food. The use of consumer tests have become more common in recent years, as they have proven to be a highly effective tool in predicting consumer preferences to be able to develop and produce products that will sell in large quantities or allows a higher prices. Affective tests are often used as a part of market consumer surveys, to get the consumer perspective/ opinions on products i.e. localize product benefits and product flaws. Generally the reason behind the conduct of consumer tests are; product maintenance, product improvement or optimization, development of new products, assessment of market potential, product category review, and support for advertising claims. Descriptive analysis on the other hand, uses small number of panelists who are always trained. A descriptive analysis panelist consists of between 6–12 individuals usually used to identify and quantify specific sensory attributes or all of the attributes of a food. Descriptive analysis is ideal for shelf-life testing, especially if the panelists are well trained and available, and give consistent results over time. Descriptive panelists are not asked about likes and dislikes, i.e. they serve as measurement or analytical tools instead (Mason and Nottingham, 2002; Stone and Thomas, 2012).

## METHODOLOGY

A descriptive study design (cross-sectional survey) was employed in the study. A simple random sample of 70 respondents was taken on the Tamale Technical University campus to constitute the untrained consumer panel; the most suitable sample for acceptance or preference tests of food products (Lawless and Heymann, 2010). A structured food sensory assessment questionnaire was designed and used in collecting data on the panelists' preferences for the tiger nut's cake eating quality attributes (i.e. colour, taste, texture, flavor, etc). Analysis of the data gathered from the field survey was done using Microsoft Excel software, 2016 version. The Microsoft Excel software was used in transforming the data obtained into simple frequencies and percentages.

## RESULTS AND DISCUSSION

Results on the evaluation of the tiger nut cake's colour revealed that 31% liked the colour very much, those who moderately liked its colour was 40%. Sixteen (23%) of respondents sampled neither like nor dislike the cake based on colour. Six per cent 6% disliked the colour moderately but none very much dislike the colour. Overall, the acceptance level for the cake's colour was 71%. For many products including food, colour is one of the foremost attributes which the consumer perceives first, so for the colour to have obtained over 70 per cent acceptance mean it is capable of commanding demand on the market. The study results show that, 30 per cent of respondents moderately liked the flavour of the cake and 47 per cent liked the flavour very much. Thirteen per cent neither liked nor disliked the flavor; 1 per cent very much disliked the cake's flavour and another 9 per cent of respondents also disliked the flavour moderately. Flavour as a composite variable (aroma/ smell & taste) is perceived at two levels using nose and tongue respectively, aroma of food may be perceived a distance away from the product depending the types and amounts of volatile aromatic compounds emanating from it. The tiger cake's flavour received a higher acceptance than its colour. But specifically when respondents were asked about the taste the results show that 82 per cent liked the cake whereas only 1 per cent disliked it. A significantly high proportion (17 per cent) however was unable to form an opinion about the cake's taste.

### Summary

To sum up, the sampled respondents generally accepted the tiger nut cake since for each of attributes assessed, more than 70 per cent of them liked it. However, based on the specific attributes of the cake, the order of preference was as follows 82%, 77%, 71% for the cake's taste flavour and colour respectively.

### Conclusion

The results on the tiger nut cake means that generally it was accepted by the sampled study respondents. However, the cake's strength of marketability lies in its taste. That is, it will easily be marketed by its taste than any of the other organoleptic characteristics. The result also showed that tiger nuts are rich in energy giving nutrients (carbohydrate and fats), phosphorus, potassium, magnesium and preventive or protective nutrients (fiber, iron, copper, zinc, vitamins C and E). They are fairly high in protein and calcium and low in sodium. Tiger nut products are rich in vitamins B1, B2, C and E. Tiger nut and its products could bring many benefits to people in developing countries by playing important roles in providing food security, enhancing livelihoods, improving nutritional status and social wellbeing of vulnerable groups. Tiger nuts and its products could thus, go a long way in aiding to alleviate problems of malnutrition and non-communicable diseases.

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