International Journal of Applied Chemical and Biological Sciences (2023), 4(1), 28-36
ISSN- 2582-788X

RESEARCH PAPER

Article Identifier: https://identifier.visnav.in/1.0001/ijacbs-23a-30003/

Production, Sensory and Proximate Evaluation of Cake from Blends of Wheat, Cocoyam and Tiger Nut Flour Fortified with Avocado Pear

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Received on: 30 December 2022 *Published on: 16 February 2023*

ABSTRACT

The proximate composition and sensory properties of cake prepared from blends of wheat, cocoyam and tiger nut flour fortified with avocado pear was investigated using standard methods. The composite flours of wheat, cocoyam and tiger nut was blended with avocado pear in the ratios of 100:0:0:50 (CS_1), 50:25:25:50 (CS_2), 37.5:37.5:25:50 (CS_3) and 100:0:0:0 (CS_4) and were used for the production of cake. The result of the proximate composition showed that there was significant difference ($p < 0.05$) in all the samples. CS_3 had the least value for moisture, lipid and protein while CS_4 had the highest values for moisture and lipid and CS_1 had the highest protein value. The result for carbohydrate and crude ash content of the cake increased gradually with increased level of cocoyam and tiger nut, CS_4 had the least carbohydrate and crude ash value while CS_3 has the highest value for carbohydrate and crude ash. The crude fibre and lipid values decreased with increase in cocoyam addition. The sensory evaluation carried out showed that there was no significance difference ($p > 0.05$) in terms of taste, aroma and texture for all the cake samples. In terms of general acceptability and appearance, the control sample (CS_4) had the highest score.

Keywords: Avocado Pear, Cake, Cocoyam Flour, Proximate Composition, Tiger Nut Flour

1. INTRODUCTION

Utilization of local and readily available raw materials in the food manufacturing industries is key to Africa's transformation. Cake is a sweet flour mix usually made from wheat flour, sugar, shortening and other ingredients and is usually baked [1]. Cakes in their oldest forms were modifications of bread but cakes now cover a wide range of preparations that can be simple or complex. Consumption of various bakery and confectionary products is the demand of time due to change in food habit of the people. Preparation of plain cakes from wheat flour is the conventional practice however, in tropical countries, wheat production is

limited and importation of wheat flour to meet local demand is a necessity [2].

Cocoyam (*Colocasia esculenta***)**: Cocoyam is herbaceous perennial plant belonging to the araceae family and constitutes one of the six most important roots and tuber crops world-wide [3]. They are among the major crops grown in wetlands with minimal inputs and offer high potential for alleviating food insecurity and income constraints. Nutritionally, cocoyam supplies easily digestible starch [4] and are known to contain substantial amounts of protein, vitamin C, thiamine, riboflavin, niacin and significant amounts of dietary fibre [5]. Cocoyam is a rich source of carbohydrate, dietary fiber, but low in fat, protein and ash content [6]. It has been widely reported that cocoyam possesses the smallest starch grain-size relative to other roots and tubers. This makes cocoyam suitable for several food products for potentially allergic infants, persons with gastro-intestinal disorders as well as diabetic patients [7]. The smallest starch molecules of cocoyam have been associated with increased digestibility over other crops, making it suitable for feeding invalids, production of confectioneries and baby foods [8]. The carbohydrate fraction of cocoyam consists of 2.6 per cent pentosans which makes it a possible alternative for industrial pentosans used in confectionery [9].

Despite the importance and nutritive value of cocoyam in Nigeria and many other nations, its industrial potential as well as its contribution to food security has been grossly under-estimated [10] as it had been regarded as “poor man’s food” or “women crop”

Tiger-nut (*Cyperus esculentus*) is an underutilized crop which has been found to be cosmopolitan perennial crop of the same genus as the papyrus plant [11]. The high crude lipid, carbohydrate contents and its fairly good essential amino acid composition makes it a valuable source of food for man and can be consumed raw or processed into other valuable products. According to Belewu & Abodunrin [12] and Adejuyitan et al., [13], tiger-nut produces high quality oil about 25% of its content and oil was implicated as lauric acid grade oil, non- acidic, stable and very low unsaturation. *Cyperus esculentus* has been reported to be “health” food since consuming it can prevent heart disease and thrombosis (blood clot formation in the blood vessel) [14]. It is considered a good flour additive for bakery industry since it contains high amount of natural sugar thereby avoiding the necessity of adding extra sugar and the tiger-nut Flour does not lose any of its nutritious properties in the milling process [15].

Avocado pear (*Persea americana*) is a member of the family *Lauraceae*, which are mainly shrubs and trees that yield resinous aromatic gum from their cut bark. It is among the well-known indigenous fruit trees in the tropical and subtropical rain forest zone of the Southern regions of West Africa. The fruit is a pome characterized by a central core surrounded by edible fleshy layers. Avocado fruit is a major and cheap source of nutrients containing protein, moisture, fibre, fat and carbohydrate and high energy value. They are also rich in fatty acids, amino acids, potassium, B-vitamins, vitamins K and E. Avocado fruit is much cherished by many people and it makes a significant dietary contribution, as it improves the food problems in developing countries. Besides, it is available at most seasons including strategic periods of the year when conventional staples that are difficult to store are scarce. The oils from the pulps and seeds can be used in foods, pharmaceuticals and cosmetics manufacturing as well as numerous industrial uses. They are rich in monounsaturated fatty acids and are comparable to other currently used vegetable oils [16] [17]. However, not much has been done in the area processing of the avocado pear to flour and use in baking. While every measure is being taken to boost

food production by convectional agriculture; a lot of interest is currently focused on the possibilities of exploiting the vast number of less familiar food plant resource existing in the wild [18].

Date Palm (*Phoenix dactylifera* L**):** The fruit of *Phoenix dactylifera* L., commonly called date palm is one of the most abundant fruits in the world. Date fruits are loaded with lots of health benefits, textural characteristics and irresistible sweet taste. Date fruit is very sweet and as such is used as sweetener in the production of different varieties of food products. Date fruit can be considered as a complete food since it contains the six classes of food. Date fruit contains carbohydrates in form of reducing sugars (fructose and glucose), non-reducing sugar (sucrose) as well as small amount of polysaccharides such as cellulose and starch [19]. The protein content of dates ranges from 1% - 7% and includes essential amino acids required for metabolic functioning of the human body [20]. The amino acids of most date cultivars include: lysine, histidine, arginine, aspartic acid, threonine, glutamic acid, serine, proline, glycine, alanine, cystine, valine, methionine, isoleucine, leucine, tyrosine, and phenylalanine [19]. Date fruits have little fat content, mostly concentrated in the crust. The fat content ranges between 0.1% - 0.5%, and fat plays an essential role in the protection of the fruit more than in the nutritional value of the date flesh [21]. The insoluble part of the date flesh makes up the crude fibre and it's comprised of cellulose, hemicellulose, lignin, and lignocelluloses [22]. Dates are rich in vitamins and minerals and as a consequence, confer a number of health benefits. For example, dates have been reported to have at least fifteen different minerals such as magnesium, manganese, phosphorus, iron, calcium, potassium, sodium and zinc [23][24]. Dates also have high levels of copper, selenium, potassium and magnesium, average concentrations of manganese, iron, phosphorus, cobalt, fluorine, zinc and calcium, as well as small quantities of boron [22][19]. Date fruits contain a range of phytochemicals and as a consequence, are a rich source of antioxidants. These phytochemicals are carotenoids, flavonoid glycosides, flavones, flavonols, flavoxanthin, anthocyanins, the phenolics; the cinnamic acids and their derivatives, coumaric acids, and their derivatives and so on [23][25]. The result of many research studies have confirmed the free radical scavenging properties of date fruit as well as date juice extracts. The antioxidant activity of date fruit has established the dual benefits of dates in providing an unparalleled source of natural antioxidants as well as being a good alternative for the improvement of flavor and color in food products due to their high content of active phenolic acids [26][27][28][29].

Composite flour: Composite flour is a mixture of flours obtained from either roots, tubers, cereals and legumes or their combinations with or without the addition of wheat flour with the aim of getting products that is better than the individual components.

This study therefore, aims at improving the nutritional and sensory attributes of cake for the elderly and diabetics by conditioning them with cocoyam, tiger nut, date syrup and avocado pear.

2. METHOD AND MATERIALS

2.1. Source of Raw Materials

The study was conducted in the laboratories of the Department of Food Technology, Federal Polytechnic Oko, Anambra State, Nigeria. Cocoyam (Taro), Tiger Nut, Date Palm fruits, Wheat Flour (Golden Penny, Nigeria Flour Mills Plc), Fresh Avocado Pear and cake ingredients such as salted margarine and granulated sugar (used for the control sample), eggs, vanilla flavour and baking powder were purchased from Eke Oko

market in Orumba North Local Government Area of Anambra State, Nigeria.

2.2. Production of Cocoyam Flour

Fresh cocoyam tubers were thoroughly washed with tap water, peeled using a stainless steel knife, rewashed and cut into chips. The chips were blanched at 75°C for 15 minutes in deionized water after which they were dried to a constant weight in an oven at 60°C for 9 hours. The dried cocoyam chips were milled and sieved through a 0.42mm mesh size to obtain flour. Flour obtained was packaged in Ziploc bag in preparation for composite flour preparation [30].

2.3. Production of Tigernut Flour

Fresh tiger nut roots were thoroughly sorted to remove unwanted solid materials on them. The roots were then washed thrice with tap water, drained, spread in drying trays and dried in an oven at 70^0C for 6 hours. The dried tiger nut roots were milled and sieved to obtain tiger nut flour. The flour was packaged in Ziploc bag.

2.4. Production of Avocado Pear Butter

Freshly ripe Avocado pear fruits were thoroughly washed twice with tap water, deseeded and peeled. The mesocarp was blended and packaged in a clean, dry air tight plastic container

2.5. Preparation of Composite Flour Blends

Composite flour was prepared by mixing wheat flour, tigernut flour and cocoyam flour using a Kenwood mixer at speed 6 for five minutes to achieve uniform mixing (Table 2.1). The resulting blends were packaged in Ziploc bags and used immediately in cake production. Sample CS4 served as the control.

2.6. Production of Cake

The method described by Ceserani and Kinton [31] was adopted for the cake production with slight modification. Cakes were prepared by mixing the following ingredients 500 g of flour, 200ml date syrup, 150 g avocado butter, baking powder (15g), eggs (400g), and vanilla flavor (15ml). The date syrup was mixed with avocado butter and egg albumin was added. The mixture was creamed for 30 min and other ingredients were added and mixed. The batter was poured into an 8 inch baking pan and baked at 150^oC for 45 min. For CS4, margarine was used in place of avocado butter and it served as the control sample.

2.7. Proximate Analysis

The moisture, protein, fat, crude ash and crude fibre contents of the cake was carried out according to the methods of AOAC [32], while carbohydrate was calculated by differences.

2.8. Sensory Evaluation

The cake samples were allowed to cool on racks for about 30 minutes and organoleptically estimated for the quality attributes by selected semi-trained panelists drawn from the students and staff of the Department of Food Technology, Federal Polytechnic Oko. The cake samples were evaluated by a panel of 20 judges comprising of 14 students and 6 staff (12 female and 8 male in all) who were very familiar with cake and aged between 18 and 40years. The panelists were selected based on availability, health stability, interest and familiarity with cake. Each sample was rated on perceived intensities of standard sensory attributes (Taste, Appearance, Flavour, Texture and General Acceptability) using a 9 point hedonic scale with 1 as extremely disliked and 9 as extremely liked [33].

Acceptability and preference analysis were assessed by providing 50 g of cake at room temperature to each

panelist. The cakes were coded as CS1 (100:0:0:150 wheat-cocoyam-tigernut-avocado), CS2 (50:25:25:150 wheat-cocoyam-tigernut-avocado), CS3 (25:37.5:37.5:150 wheat-cocoyam-tigernut-avocado) and CS4 (conventional) and served in disposable plastic containers, accompanied with mineral water, pencil with eraser and assessment sheets.

2.9. Statistical Analysis

All analysis were conducted in triplicates. Data were subjected to analysis of variance, and Duncan multiple range test was used to separate the means [34].

3. RESULT AND DISCUSSION

The moisture content of the cake samples ranged from 26.2% to 13.2% with CS4 and CS3 having the highest and least moisture contents respectively. The moisture content decreased with increase in the level of cocoyam flour. This is in line with the findings of Alozie and Chinma [35] who reported (18.23 to 21.66%) range of moisture for wheat cocoyam cake. The high moisture of the cake samples in the study may be due to the high moisture content of the ingredients like date palm syrup which may have raised the moisture content of the product and also the variation in the composition of the cake flours. The protein content ranged from 13.86 to 8.44 with CS1 and CS3 having the highest and least values respectively. The protein content decreased ($p < 0.05$) with increased level of substitution. This is in agreement with the work of Alozie and Chinma [35], Elleuch et al.[36] and Maneju *et al*. [37], who reported that the protein content of composite cake samples was significant ($p < 0.05$) lower than that of wheat. This could be a reflection of the higher protein content in wheat flour than cocoyam [37]. The varying protein content of the samples is as a result of the use of varying amounts of wheat, cocoyam and tigernut flour in the flour formulations. This is in contrast with the range (12.10 - 20.16%) reported by earlier workers [38]. The consumption of this baked product produced from this composite flour would supply a significant amount of protein to the body.

The values obtained for the fat content of the cake samples indicated that the cake sample made from 100% wheat and avocado butter) had the highest value of 14.22% while sample CS3 had the least values (4.30%) among the composite samples. The general decrease in the fat contents of the products may be attributable to the addition of cocoyam and the substitution of avocado with margarine. Hence, the higher fat composition of sample CS4 (containing margarine instead of avocado). It has been reported that cocoyam flour contains a lower level of mean crude fat content, also it has been reported that high-fat content could impact negatively on the shelf stability of a product due to rancidity development.

Crude fiber values showed that the sample CS2 ha significantly ($p<0.05$) the higher value (3.74%), while the least crude fiber value (2.15%) was obtained from the control samples (CS4). High fiber is of great benefit to the body, as it helps to maintain bowel integrity, lower blood cholesterol level, and control blood sugar level. The consumption of this product has potentials to provide an appreciable amount of fiber to the body for proper functioning of the digestive and excretory systems.

The ash content of the cake sample increased from 3.05% to 5.04% with incorporation of tigernut and avocado pear pulp. The values for the control samples of the cake sample were significantly ($p\leq0.05$) lower than the samples containing avocado and tigernut. This is an indication that the inclusion of tigernut and replacement of margarine with avocado pulp may enhance the amount of mineral intake in the food product [39] and

as such would contribute appreciable dietary amounts of the mineral. This result is in agreement with reports of Ayo et al., [40].

The result showed that there was a significant difference ($p \leq 0.05$) between all the samples in the carbohydrate values, where sample CS3 had the highest values of 61.08%, and CS4 had the least values of 41.37%, the presence of cocoyam may have elevated the carbohydrate composition of the samples [38]. The general decrease in carbohydrate value of the cake samples with inclusion of tigernut flour is similar to the reported carbohydrate value for cake by [38].

There was a significant decrease ($p<0.05$) in the sensory ratings of the cake with an increase in cocoyam and tigernut flour level, with colour acceptability ranging from 4.90 to 8.90, with CS3 having the least colour acceptability and CS4 having the highest value. The value for aroma ranged from 7.20 to 7.30 with CS3 having the least value and CS4 and CS1 having the highest value. Taste also ranged from 6.40 to 7.40 with sample CS3 having the least value while sample CS4 have the highest acceptability value. The overall acceptability also ranged from 6.17 to 7.30 with sample CS3 having the least value while sample CS4 have the highest acceptability value. However, the rating of texture, taste, and aroma of the control sample and the rest of the cake samples were not significantly different ($p<0.05$). The samples CS3 was rated least by the panelists. This might not be unconnected with the unpalatable taste of cocoyam flour which may have influenced the rest of the sensory parameters. Hence, the significant drop in overall acceptability of sample CS3. The addition of avocado pulp in sample CS1 produced acceptable cake of comparable quality with the control in all the sensory indicators.

4. CONCLUSION

Cakes produced with avocado pulp as fat replacer for margarine and sweetened with date palm syrup produced a consumer acceptable cake with high nutritive quality. Snacks based on wheat-avocado blend would provide a healthy snack and also protect against obesity and diabetes in both children and adults. Consequently, production of cakes of different kinds from avocado blend with wheat flour would provide an extra-nutrition especially for growing children without significantly degrading the sensory qualities.

5. ACKNOWLEDGEMENT

NA.

6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

7. SOURCE/S OF FUNDING

NA.

8. REFERENCES

1. Atef AMA, Mostafa TR, Samia AA (2011), Utilization of faba bean and cowpea flours in gluten free cake production. *Australian Journal of Basic and Applied Sciences*; **5 (12)**: 2665-2672.
2. Giami SY, Amasisi T, Ekiyor G (2004), Comparison of bread making properties of composite flour from kernels of roasted and boiled African breadfruit (Treculiaafricanadecne) seeds..*Journal of Raw Material Research;* **1**: 16-25.
3. Ekanem AM, Osuji JO (2006), Mitotic index studies on edible cocoyams (Xanthosoma and Colocasiaspp). *African Journal of Biotechnology*; **5(10)**: 846-849. FAO, (2008) Importance of
4. Sefa-Dedeh S, Sackey EK (2002), Starch structure and some properties of cocoyam

(Xanthosomasagittifolium and Colocasiaesculentum). *Food Chemistry*; **79**:435-444.

5. Niba LL (2003), Processing effects on susceptibility of starch to digestion in some dietary starch sources. *Int. J. of Food Sci. Nutrition;* **54**:97-109. http://dx.doi.org/10.1080/0963748031000042038
6. Owusu-Darko PG, Paterson A, Omenyo EL (2014), Cocoyam (Corms and Cormels)-An under exploited food and feed resource. *Journal of Agricultural Chemistry and Environment*; **3(1)**: 22-29. http://dx.doi.org/10.4236/jacen.2014.31004
7. Onyenobi et al., (2010), Marketing of Edible Cocoyam, Xanthosomaspp (Tannia) in Abia State, Nigeria. *Cocoyam Research Programme*. 2010 Annual Report and Programme of work. NRCRI, Umudike, pp. 69-73.
8. Eneh OC (2013), Towards food security and improved nutrition in Nigeria: Taro (Colocasia antiquorum) grit as carbohydrate supplement in energy food drink. *African Journal of Food Science*; **7(10)**:355-360. http://dx.doi.org/10.5897/AJFS2013.1068
9. Ubalua AO, Chukwu LI (2008), Potentials and Constraints of Cocoyam Production in Nigeria Proc. 42nd. Conf. Agricultural Society of Nigeria (ASN) October 19 – 23 2008. Ebonyi State University, Abakaliki, Nigeria. pp. 288-302.
10. Ekwe K, Nwosu K, Ekwe C, Nwachukwu L (2009), Examining the under explained values of cocoyam (Colocasia and Xanthosomaspp). Nutrition and Economy in Nigeria. In: Jarnieka H., Ganry J., ZeledonHoeshie I. and Kahara R. (eds). Proceedings of International symposium on underutilized plants for food security, Income and sustainable Development. *Acta Horticulture*; **86**:71-78.
11. Odoemelan SA (2003), Chemical composition and functional properties of conophor nut flour (*Tetracarpidium conophorum*) flour. *Int. J. Food Sci. Technol*; **38**: 729-734.
12. Belewu MA, Abodunrin OA (2008), Preparation of kunnu from unexploited rich food source: Tiger nut (*Cyperus esculentus*). *Pak. J. Nutr*; **7**: 109-11.
13. Adejuyitan JA, Otunola ET, Akande EA, Bolarinwa IF, Oladokun FM (2009), Some physicochemical properties of flour obtained from fermentation of tigernut (*Cyperus esculentus*) sourced from a market in Ogbomoso, Nigeria. *Afr. J. Food Sci*; **3**: 51-55.
14. Chukwuma ER, Obioma N, Christopher OI (2010), The phytochemical composition and some biochemical effect of Nigerian tiger nut (Cyperus esculentus L) Tuber. *Pakistan J nutr*; **9**: 709-715.
15. Akajiaku LO, Kabuo NO, Alagbaoso SO, Orji IG Nwogu AS (2018), Proximate, Mineral and Sensory Properties of Cookies Made from Tiger Nut Flour. *J. Nutr Diet Pract*; **2(1)**, 1-5.
16. Amusa NA Ashaye OA (2009), Effect of Processing on Nutritional, Microbiological and Sensory Properties of Kunun-Zaki (A Sorghum Based Non-Alcoholic Beverage) Widely Consumed in Nigeria. *Pakistan Journal of Nutrition;* **8***:* 288-292.
17. Duester G (2000), Families of retinoid dehydrogenases regulating vitamin A function Production of visual pigment and retinoic acid. *European Journal of Biochemistry*; **267**: 4315-4324. https://febs.onlinelibrary.wiley.com/doi/epdf/10.1046/j.1432-1327.2000.01497.x.
18. Rao PU (1994), Nutrient composition of some less-familiar oil seeds. *Food Chem*; **50**:37982.
19. Al-Shahib W, Marshall RJ (2003), The Fruit of the Date Palm: Its Possible Use as the Best Food for

the Future? *International Journal of Food Sciences and Nutrition*; **54**: 247-259. https://doi.org/10.1080/09637480120091982

20. Sablani SS, Shrestha AK, Bhandari BR (2008), A New Method of Producing Date Powder Granules: Physicochemical Characteristics of Powder. *Journal of Food Engineering*; **87**: 416-421. https://doi.org/10.1016/j.jfoodeng.2007.12.024
21. Biglari F, AlKarkhi AFM, Easa AM (2008), Antioxidant Activity and Phenolic Content of Various Date Palm (*Phoenix dactylifera*) Fruits from Iran. *Food Chemistry*; **107**: 1636- 1641. https://doi.org/10.1016/j.foodchem.2007.10.033
22. Barreveld WH (1993), Date Palm Products. FAO Agricultural Services Bulletin, No. 101.
23. Al-Farsi M, Alasalvar C, Morris A, Baron M, Shahidi F (2005), Compositional and Sensory Characteristics of Three Native Sundried Date (*Phoenix dactylifera L.*) Varieties Grown in Oman. *Journal of Agriculture and Food Chemistry*; **53**: 7586-7591. https://doi.org/10.1021/jf050578y
24. Khan M, Sarwar A, Wahab M, Haleem R (2008), Physio-Chemical Characterization of Date Varieties Using Multivariate Analysis. *Journal of Food Agriculture*; **88**: 1051-1059. https://doi.org/10.1002/jsfa.3187
25. Shahidi F, Naczk M (2004), Phenolics in Foods and Nutraceuticals. CRC Press, Boca Raton,FL. https://doi.org/10.1201/9780203508732
26. Biglari F, AlKarkhi AFM, Easa AM (2008), Antioxidant Activity and Phenolic Content of Various Date Palm (*Phoenix dactylifera*) Fruits from Iran. *Food Chemistry*; **107**: 1636-1641. https://doi.org/10.1016/j.foodchem.2007.10.033
27. 27. Elleuch et al., (2008), Date Flesh: Chemical Composition and Characteristics of the Dietary Fibre. *Food Chemistry*; **111**: 676-682. https://doi.org/10.1016/j.foodchem.2008.04.036
28. Allaith AAA (2008), Antioxidant Activity of Bahraini Date Palm (*Phoenix dactylifera L.*) Fruit of Various Cultivars. *International Journal of Food Science and Technology*; **43**: 1033-1040.
29. Al-Farsi M, Lee CY (2008), Nutritional and Functional Properties of Dates: A Review. *Critical Review in Food Science and Nutrition*; **48**: 877-884. https://doi.org/10.1080/10408390701724264
30. Njintang et al., (2008), Effect of taro (Colocasia esculenta) flour addition on the functional and alveographic properties of wheat flour and dough. *Journal of the science of food and agriculture*; **88(2):** 273 – 279.
31. Ceserani V, Kinton R (2008), Practial Cookery (10th ed.). *John Wiley and Sons*, New York.
32. A.O.A.C. (2010), *Official method of analysis*. Association of Official Analytical Chemists. (**18th edition**), Washington D.C., U.S.A.
33. Ihekoronye AI, Ngoddy PO (1985), *Integrated Food Science and Technology for the tropics*. Macmillian Publishers Ltd. London pp 178- 180, 305-306, 372-373.
34. Duncan DB (2005), Multiple Ranges and Multiple F-tests. *Biometrics;* **2:**1-42.
35. Alozie YE, Chinma CE (2015), Proximate composition, physical and sensory properties of cake prepared from wheat and cocoyam flour blends. *J. Food Res*; **4**: 181.
36. Elleuch M, Bedigian D, Roiseux O, Besbes S, Blecker C Attia H (2011), Dietary fibre and fibre-rich by-products of food processing: Characterisation, technological functionality and commercial applications: *Rev. Food Chem*; **124**: 411-421.
37. Maneju H, Udobi CE, Ndife J (2011), Effect of added brewers dry grain on the physical, chemical,

microbial and sensory quality of wheat bread. *Am. J. Food Nutr*; **1(1)**: 39-43.

38. Okorie SU, Onyeneke EN (2012), Production and Quality Evalution of Baked Cake from Blend of Sweet potatoes and Wheat Flour. *Natural Applied Sciences*; **3**:2.
39. Adebayo-Oyetoro AO, Olatidoye OP, Ogundipe OO, Akande EA, Isaiah CG (2007), Evaluation of complementary food formulated from fermented sorghum, walnut and ginger. *Journal of Applied Biosciences;* **54**: 3901– 3910.
40. Ayo JA, Onuoha OG, Ikuomola DS, Esan YO, Ayo VO, Oigiangbe JG (2010), Nutritional Evaluation of Millet-beniseed Composite Based Kunun-zaki. *Pak. J. Nutr*; **9(10)**: 1034-1038.