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Research Article

Sensory Evaluation of Confectionaries Derived from Water Yam (*Dioscarea alata*)

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Abstract

Introduction: Water yam (*Diosearea alata*) is one of the highly rated food crops of the tropical world, which serves as an important source of carbohydrate for millions of people.

Objectives: The study was conducted to organoleptically evaluate confectionaries (cake, biscuits and strips (cassava-based snack)) produced from six (6) water yam (*D. alata*) varieties: (*Ume/680, TDa 291, TDa 03/00203, TDa 98/1176, Ominelu, and TDa 98/1166*).

Materials and Methods: Biscuits, cakes and strips were produced from six varieties of *D. alata.* The different standard procedures for producing snacks (biscuits, cakes and strips) were adopted. The sensory attributes (appearance, taste, texture and general acceptability) of the snacks were evaluated by 20-member taste panels on a 7-point Hedonic scale.

Result: The confectionaries produced from *D. alata* varieties were all acceptable. The color of cake (5.50), biscuit (4.81) and strip (6.25) produced from variety Ume/680 were significantly different (P< 0.5) from those of *TDa 03/00203* (cake (2.75), biscuit (3.56), strip (2.13)) and *TDa 98/1166* (cake (3.56), strip (3.94)). The taste of cakes and biscuits produced from Ume/680 variety had the highest scores of 5.69 and 5.00 which were even higher than that of the control (4.88 and 4.94) though not significant at (P < 0.5).

Conclusion: Based on the findings, water yam especially (Ume/680) variety can conveniently substitute wheat and cassava flours in biscuit, cake and strip production.

Keywords: Water Yam; Snacks; Cakes; Biscuits; Strips and Production

Introduction

Water yam (*Dioscorea alata*), also referred to as greater yam is among the six economically important species of yam cultivars [1]. They belong to the genus *Dioscreace* (family Dioscoreaceae) that form edible tubers. Yams are perennial herbaceous vines cultivated for the consumption of their starchy tubers in Asia, Africa, Central and South America, and Oceania [2]. It is one of the highly rated food crops of the tropical world, which serves as an important carbohydrate staple for millions of people in both the tropical and subtropical countries in West Africa [3]. *D. alata* is popular and prevalent within Abakaliki agro ecological zone of Ebonyi State Nigeria where it is called 'Mbala" or "Nvula" [4].

In Nigeria, especially in south eastern region, *D. alata* varieties are mostly consumed in boiled, roasted and fried forms and eaten with source or palm oil. They can also be processed into flour and reconstituted into fufu dough. Generally, they contain less sugar and have an extended shelf life [5], which ensures availability in period of scarcity. According to Faustina., *et al.* [6], water yam contains high amylose and total dietary fiber (TDF) compared to that reported for brown rice, it also contains low sodium and high potassium 83 – 131 mg. These observation projects water yam a healthy food for the management of diabetics and other chronic diet related issues due to their slower absorption rates.

Snacks are small portions of food eaten between meals [7]. Handy snacks like biscuits, cakes, strips, nuts, fruits, vegetables and drinks can be taken as in-between meals during office hours, in the farm, when travelling and other circumstances when meal is required to sustain life outside home. The fact is that wheat is the major raw material in the production of most snacks. In Nigeria, wheat production is limited and wheat flour is imported to meet local flour needs of bakery products [8], thus leading to relatively high price of bakery goods. According to Omoh [9], the high importation of finished products in Nigeria has resulted in continued low capacity utilization and low production in Nigerian–based companies and industries.

However, composite flour has been used extensively in the production of confectionaries. Olaoye [10] reported the use of composite flour of wheat, plantain, and soybean in bread making. Composite flour of wheat and peanut has been used in bread production [11]. In a similar report, composite flour of cassava and mungbean flour was used in snack production [12]. Etundiaye [13] also reported the use of sweet potato flour in cake production. Several at-

tempts have been made to produce cookies from different types of composite flours [14]. All these efforts are right steps in right direction that is capable of ameliorating the present economic situation in Nigeria.

The objective of this work is to utilize flour from different varieties of *Dioscorea alata* that is locally produced in the country as substitutes to wheat in the production of snacks (cakes and biscuits) and as a substitute to cassava flour in the production of strips.

Producing snacks with flours from local foods will not only reduce the cost of snacks but would provide healthier snacks that are accessible. Therefore, to diversify the utilization and consumption of local foods and to promote food availability and accessibility, flour produced from different varieties of *Dioscorea alata* was used in the production of cake, biscuit and strip. The products were organoleptically evaluated.

Material and Methods

Six varieties of *D. alata: Ume/680, TDa 291, Ominelu, 98/1176, TDa 95/116* and *TDa 03/00203* were collected from yam program of the National Root Crops Research Institute (NRCRI), Umudike.

Preparation of flour samples

The water yam tubers were peeled, washed and chipped using the locally fabricated chipping machine of National Root Crops Research Institute, Umudike. The chips were spread thinly on black nylon and sun dried for 72 days. The dried yam chips were then milled into fine (2mm) powdered flour using a local machine. The different flour samples were packaged in clean polythene containers until required to produce the confectionaries.

Production of cakes, biscuits and strips

Flour samples were obtained from *D. alata* varieties (*Ume/680, TDa 291, Ominelu, 98/1176, TDa 95/116 and TDa 03/00203*). Hundred percent (100%) of the various flours obtained were used as substitute to wheat and cassava in cake, biscuit and strips production. Again, 100% cake, biscuits and strips were also produced from wheat and cassava flours, respectively which served as control (one control for each of the snacks). Recipe for snack production is presented in table 1 below. The method described by Aneidu and Oti [9] was adopted for cake and strips production while the method described by Oyewole., *et al.* [10] was used for biscuits production with little modification.

Procedure for baking cake

The baking fat and granulated sugar were creamed together with a Kenwood mixer until light (for 20 minutes). The eggs were beaten for 5 minutes with an egg whisker until light. The creamed fat was placed in a bowl and the egg was gradually added bit-by-bit until a smooth texture was obtained. The sieved flour and baking powder were added to form a smooth batter. The mixed batter was mixed with milk and water to proportion and poured into greased cake pans. The oven was pre-heated for 5 minutes. The various samples were put in the oven and baked at temperature of 190°C for 15 min. The cakes were cooled and removed from the pan after 1 h. The cooled cakes were packaged in aluminum foils and kept for sensory evaluation. The same treatment was applied in the production of cake from wheat flour.

Food materials	Cake	Strips	Biscuit
Flour	100g	100 g	100 g
Sugar (granulated)	10 g	-	20 g
Margarine	15 g	-	40 g
Onions	-	25 g	-
Salt	0.5g	3 g	As required
Egg	20 ml	-	50 g
Baking powder	2.5 g	-	2 g
Grated nut meg	2.5 g	-	2 g
Vanilla essence	1 ml	-	-
Milk powder	2 ml	-	10 g
Water	As required	hot water	As required

Table 1: Recipes for the production of confectionaries (cake, biscuits and strips).

Source: Aniedu and Oti [15] (strips and cake); Oyewole., *et al.* [16] (biscuit).

Procedure for baking biscuit

The margarine and sugar were mixed in a bowl and creamed until the mixture became light and fluffy. One whole egg and milk powder were added to the cream while mixing. After 40 minutes of mixing, flour, baking powder and salt were slowly introduced into the mixture. The dough obtained was rolled on a flat rolling board sprinkled with flour to a uniform thickness using wooden rolling pin. Biscuit cutter was used to cut the dough into fine shapes which were placed on well greased baking trays. The biscuits were placed in an oven at 150^0C for 20 minutes until they are pale brown in colour. The biscuits were cooled and removed from the tray after 30 minutes. The cooled biscuit samples were packaged in an aluminum foil ready for the sensory evaluation. The same treatment was applied in the production of biscuit from wheat flour.

Procedure for frying strips

The flour was shared into two equal parts. The onion was blended thoroughly in an electric blender. A portion of the flour was jelled with hot water to introduce a binding texture. Salt and the blended onions were added to the other portion of flour and mixed homogenously with the jelled portion. Thick rough dough was obtained. The dough was placed in a metal extruder and pushed over pre-heated oil. The gas flame was increased to prevent the strips from absorbing too much oil. The fried strips were poured into a metal sieve and allowed to cool for 10 minutes. The cooled strips were packaged ready for sensory evaluation. The same treatment was applied in the production of strips from cassava flour.

Sensory evaluation

A seven-points Hedonic scale as described by Iwe [17], where 7 is the highest score (liked extremely) and I the lowest score (dislike extremely) was used to evaluate the taste, appearance, texture and general acceptability of the cakes, strips and biscuits. Twenty-member taste panelist participated in the sensory evaluation.

Statistical analysis

The statistical analytical system (SAS), a software package (1999, version) was used for the statistical analysis of the sensory evaluation scores. Analysis of variance (ANOVA) was used for mean separation using fisher's least significant differences (LSD) ($P > 0.05$).

Results

The results of the sensory evaluation are presented in Tables 2 to 4.

Samples	Appearance	Taste	Texture	G/Acceptability
A	4.81	5.00	4.50	5.06
B	4.75	4.12	4.81	4.81
C	3.56	4.12	4.69	4.38
D	4.06	4.50	4.50	4.12
E	4.38	4.44	4.06	4.25
F	3.94	4.25	4.25	4.75
G	6.13	4.94	5.05	5.27
LSD (P<0.05)	1.23	1.34	1.25	1.34

Table 2: Sensory evaluation result of biscuits.

A= *Ume/680*, B= *TDa 291*, C= *TDa 03/00203*, D= *98/1176*, E= *Ominelu,* F= *TDa 98/1166* and G= Wheat (control).

Samples	Appearance	Taste	Texture	G/Acceptability
A	5.50	5.69	5.31	5.50
B	5.38	5.25	5.69	5.50
C	2.75	4.56	4.19	4.81
D	4.06	4.94	4.62	5.19
E	4.25	4.81	5.19	5.25
F	3.56	5.00	4.94	4.44
G	5.18	4.88	5.31	5.44
LSD (P<0.05)	1.20	1.20	1.16	1.40

Table 3: Sensory evaluation result of cakes.

A= *Ume/680*, B= *TDa 291*, C= *TDa 03/00203*, D= *98/1176*, E= *Ominelu*, F= *TDa 98/1166* and G= Wheat (control)

Samples	Appearance	Taste	Texture	G/Acceptability
A	6.25	5.19	5.38	5.69
B	5.75	4.56	5.06	5.06
C	2.13	2.94	3.94	3.63
D	4.88	4.94	5.19	5.25
E	4.62	5.19	5.25	5.44
F	3.94	5.06	5.50	5.25
G	5.94	5.44	5.62	5.69
LSD (P<0.05)	1.03	1.06	0.94	1.01

Table 4: Sensory evaluation result of strips.

A= *Ume/680*, B= *TDa 291*, C= *TDa 03/00203*, D= *98/1176*, E= *Ominelu*, F= *TDa 98/1166* and G= *Cassava* (control)

Discussions

The sensory evaluation result for biscuits, cakes and strips shows that all the snack products from varieties *Ume/680* and *TDa 291*, were more acceptable to the panelist in terms of appearance compare to the products from other water yam varieties (*TDa 03/00203, 98/1176, Ominelu*, and *TDa 98/1166*). Table 2 shows that the appearance of biscuits (6.13) produced from 100% wheat flour was significantly different ($P>0.05$) from those produced from 100% water yam flour *Ume/680* (4.81), *TDa 291*(4.75), *TDa 03/00203* (3.56), *98/1176* (4.06), *Ominelu* (4.38) and *TDa 98/1166* (3.94) varieties. This does not correspond with the findings of [18], who observed no significant differences in taste, aroma and overall acceptability of biscuit produced from cassava- wheat-soybean flour composite, maybe due to the variation in the composite flours used. Table 3 revealed that cakes produced from variety Ume/680 and *TDa 291* flour samples were highly rated by the panelist, the scores were even higher than cakes produced from wheat flour though not significant ($P>0.05$). In a similar research [13], reported that taste, aroma, texture and appearance of cakes produced from sweet potato- wheat composite flour to be acceptable to the panels. From Table 4 it was found that the appearance of strips produced from Ume/680 (6.25) *D. alata* variety ranked higher than strips produced from 100% cassava flour (5.94), not significant ($P>0.05$). This corresponds with the findings of [12], who observed no significant differences in strips produced from different proportions of cassava-mungbean composite flour with strips from 100% cassava flour. Generally, the higher acceptability observed with the snacks (biscuits, cakes and strips) produced from wheat and cassava flour with snacks from some water yam varieties could be due to the fact that the test panels were made up of individuals who are already used to the original products. According to Costell [19] repeated consumption or rejection of any food product is greatly influenced by the increase in acceptability due to habitual consumption Luckow., *et al.* [20]; Stein., *et al.* (2003) or whether the food fulfils consumers' expectations of sensory quality [21]. However, the ap-

pearance of cake (5.50), biscuit (4.81) and strip (6.25) produced from variety Ume/680 were significantly different (P< 0.5) from those of *TDa 03/00203*, cake (2.75), biscuit (3.56), strip (2.13) and *TDa 98/1166,* cake (3.56), strip (3.94). It was also found that the appearance of snacks produced from varieties *TDa 03/00203* and *TDa 98/1166* were ranked low by the panels.

Conclusion

It could be concluded that the panelist preferred products (cake and biscuits) from *Ume/680* variety of *Dioscorea alata* to those produced from wheat flour. This lends credence to the use of *Ume/680 D. alata* variety in the production of confectionaries especially cake, and biscuits. There is need to chemically investigate the nutrient composition of the finished snack products.

Limitations of the Study

The major limitation of the study is lack of result on the chemical (proximate and anti-nutritional) compositions of the snacks.

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Bibliography

1. Baah FD., *et al*. "Nutritional and biochemical composition of D. alata (Dioscorea spp). Tbers;". *Journal of Food Agriculture and Environment* 7.2 (2009): 373-378.
2. https://en.wikipedia.org/wiki/Yam_(vegetable)
3. Hahn SK. Yams; Duiscirea spp. (Dioscoreacae). In: J. Smart and N.W Simmonds (eds), Evolution of Crop Production in Tropical Africa, Directorate general for International Cooperation (DGIC), Belgium (1995).
4. Udensi., *et al*. "The investigation of chemical composition and functional properties of water yam (Dioscorea alata). Effect of varietal differences". *Pakistan Journal of Nutrition* 7.2 (2008): 342-344.
5. Raemackers RH. Crop production in TropicalAfrica. DirectorateGeneralforInternationalco-operation (DGCC), Belgium (2001).
6. Faustina Dufie., *et al*. "Potential health benefits of water yam (Dioscorea alata)". *US National Library of Medicine National Institutes of Health* 4.10 (2013):1496-1501.
7. https://en.wikipedia.org/wiki/Snack. 7/09/2016
8. Eleazu C., *et al*. "Effect of partial replacement of wheat flour with high quality flour on the chemical composition, antioxidant activity, sensory quality and microbial quality of bread". *Preventive Nutrition and Food Science* 19.2 (2014): 115-123.
9. Omoh G. "Nigeria's high import of finished goods hurting economy". (2016).
10. Olaoye A and Onilude AA. "Microbiological, proximate analysis and sensory evaluation of baked products of wheat-plantain and soybean composite flour. *African Journal of Food, Agriculture, Nutrition and Development* 8.2 (2008): 195-202.
11. Yusuf PA., *et al*. "Effect of partial replacement of wheat with peanut flour on the chemical, sensory and microbial quality of bread". *Nigerian Journal of Nutrition Science* 37.1 (2016): 72-77.
12. Aneidu, C and Agugo UA. "Sensory Evaluation of cassava-based products Complemented with mungbean flour and paste". *Nigerian Journal of Nutrition Science* 29.2 (2008): 276 -284
13. Etudaiye, HA., *et al*. "Sensoryevaluation of sweet potato baked cakes". In: The proceeding of Nigerian Institute of Food Science and Technology (NIFST). 35th annual conference and AGM. Value addition to Nigerian food raw materials; A panacea for national food security and poverty reduction (2011): 77-78.
14. Eneche EH. "Biscuit-making potential of millet/pigeon pea flour blends". *Plant Foods for Human Nutrition* 54 (1999): 21-27.
15. Aneidu C and Oti E. Sweet potato based recipes. Extension Bulletin, National Root Crops Research Institute, Umudike. (2007): 7-15.
16. Oyewole OB., *et al*. "Production of biscuits using cassava flour". *Nigerian Food Journal* 14 (1996): 24-28.
17. Iwe MO. "Handbook of Sensory Methods and Analysis". Rojoint Communication Services Ltd, Uwani-Enugu (2002).
18. Oluwamukomi MO., *et al*. "Physicochemical and sensory properties of wheat-cassava composite biscuit enriched with soy flour". *African Journal of Food Science* 5.2 (2011): 50 – 56.
19. Costell, E., *et al*. "Food acceptance: The role of consumer perception and attitudes". *Chemosensory Perception* 3.1 (2010): 42-50.
20. Luckow T., *et al*. "Determining the odor and flavor characteristics of probiotic, health-promoting ingredients and the effects of repeated exposure on consumer acceptance". *Journal of Food Science* 70(2005): S53-S59.
21. Cardello AV. "Consumer expectations and their role in food acceptance". 488 In: HJH MacFie and DMH Thomson (Eds.). Measurement of Food Preferences 489 (1994): 253-297. Blackie Academic and Professional, London.

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