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FUNCTIONAL PROPERTIES OF CAKE SUPPLEMENTED WITH SWEET POTATO AND CAMEL MILK

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ABSTRACT

Sweet potato flour and Camel milk can serve, as a source of some nutrients, natural sweetness, colors and flavor, to prepare food product formulas. Both of them, alone or together, could be considered as an excellent novel source of natural health-promoting compounds in the functional food market. Sweet potato flour contains plenty amounts of β-carotene and anthocyanins, while, camel milk is a very important food stuff, due to its low cholesterol, low sugar, high minerals and vitamin C contents. The physico-chemical and sensory properties of cakes containing different concentrations of the tested sweet potato powder and camel milk as a partial replacement of wheat flour were estimated. The present results showed that, total phenolic compounds and antioxidant activity were increased by increasing the potato powder in the cake. The cake height and volume were decreased, compared with the control sample. The tested cake showed no significant differences in terms of odor, texture and over all acceptability. The results showed, also, that cakes prepared by the sweet potato powder and camel milk had significant higher β-carotene contents than that of control cakes. Therefore, it could be concluded that sweet potato powder and camel milk can be used as functional ingredients in cakes. Consequently, the tested caked could be considered an excellent source of vitamin A for children and adults (male and female).

***Keywords*:** sweet potato powder, camel milk, cake, chemical properties, sensory evaluation, β-carotene, antioxidants.

Introduction

Vitamin A deficiency (VAD) prevalence among mothers and children has internationally prompted the search for actions to combat it. These actions include supplementation, food fortification, biofortification, and diet diversification coupled with nutrition education (Berti *et al*., 2014).

Sweet potato (*Ipomoea batatas*) is a very important staple food crop. It believed to contribute to the prevention of vitamin A deficiency (VAD) disease. Sweet potato can be used to develop composite flour and added to several products such as bread, cake, doughnuts, etc. This will help to increase the β-carotene intake in a community and prevent the Vitamin A Deficiency (VAD) in the long run (Ndirigwe 2006).

Sweet potato flour made from the roots with high level of β-carotene is a source of vitamin A which has beneficial effects on human health such as improvement on immunity and reduction of degenerative illnesses such as cancer, cardiovascular and macular degenerations (Rodriguez-Amaya 2001, van Jaarsveld *et al*., 2006).

β-carotene is an important precursor of vitamin A and imports attractive color to food products such as, cakes, desserts, juice, butter and margarine. However, β-carotene and other carotenoids are readily oxidized, being affected by the presence of air (oxygen), heat and light which greatly restricts the application of β-carotene in food and beverages (Adegunwa *et al.*, 2011).

Sweet potato flour can be partially replaced the wheat flour in production of cakes, biscuits and other products used in school feeding and mother-infant support (Julianti *et al.*, 2017).

The sweet potato is an excellent source of natural health-promoting compounds for the functional food market, such as phenolic acids, vitamins, β-carotene, and anthocyanins, and minerals (Ca, K , Fe, P, and Zn). It can, also, add natural sweetness, color, flavor and dietary fiber to processed food products(Grace *et al*., 2014a and b and Alloush, 2015).

Sweet potato flour can serve as a source of energy and nutrients such as carbohydrates, βeta-carotene (Do Nascimento *et al*., 2015).

Camel milk (*Camelus dromedarius*) so called white gold of the desert is more similar to human milk than any other milk and differs from other ruminant milk because it contains low cholesterol, low sugar, high minerals (sodium, potassium, iron, copper, zinc and magnesium), high vitamin C, protective proteins like as lactoferrin, lactoperoxidase, immunoglobulins, lysozyme. Camel milk is very important source of nutrient for human in several arid and semi- arid zones. It's complex mixture of fat, protein, lactose, mineral and vitamins miscellaneous constituent dispersed in water (Faraz *et al*., 2020).

The aims of the current study are to evaluate the nutritional values of the tested materials (sweet potato powder and camel milk) and the tested prepared cakes in addition to the sensory properties of such cakes prepared from sweet potato and camel milk and verify the best level of sweet potato substitution as a natural source of beta carotene. Estimation of the tested materials in improving the potent antioxidant activity and the nutritional value of the resulted prepared cake without affecting the sensory attributes was, also, extended.

Materials and Methods

Materials

Sweet potato *(Ipomoea batatas* Lam) samples were obtained from a local market at Giza, Egypt. The sweet potatoes species were identified by specimen experts at the Department of Vegetables Crops, Faculty of Agriculture, Cairo University.

Camel milk was obtained from a camel milk farm at MarsaMatroh station, Animal Production Research Institute, Agricultural Research Center, Giza, Egypt. Milk samples were kept in cooled boxes until transported to the laboratory. Wheat flour (72% extraction rate) and other food ingredients, including sugar, vanilla, butter, eggs, salt, baking powder, etc., were obtained from local super markets at Giza, Egypt.

All other chemicals used were of reagent grade and obtained from specific companies at Egypt.

Methods

Preparation of Sweet Potato Powder

The sweet potato powder was prepared using the method described by Singh *et al.* (2008). The orange fleshed sweet potato tubers were either unpeeled or peeled and manually cut into thin pieces (~2 mm). The potato slices were then first immersed in 1% NaCl solution, and in a solution containing potassium metabisulphite (1%) and citric acid (0.5%) for 30 min to prevent browning reactions and enhance the color of the flour. Drying of sweet potato slices was done on perforated trays in a tray air forced dryer at 55°C till a constant weight. The dried sweet potato chips were milled into powder using a laboratory grinder and passed through 250 µm mesh sieves, packed in airtight containers and stored in the refrigerator till further use. The flow chart for the preparation of sweet potato powder is shown in Figure (1).

Preparation of Cakes

The ingredients of the tested cake formulas are shown in Table (1). The control sample cake, in this study, were prepared in accordance to AACC (1983) with some modification. For cake preparation, dried ingredients were combined except sugar. The sugar was added to the butter and beaten for 3 min. Eggs were beaten and vanilla was added to the beaten eggs then water, egg-vanilla mixture was gradually added to the mixture and creaming for 2 min. The wheat flour was gradually added to the last mixture over a period of 7 min between the additions with good creaming mixing until the whole wheat flour amount was added to prevent the curdling of butter. After butter development of a soft. The mixed butter, each at 80g were mixed with milk and water to proportion and poured into greased pan cake.

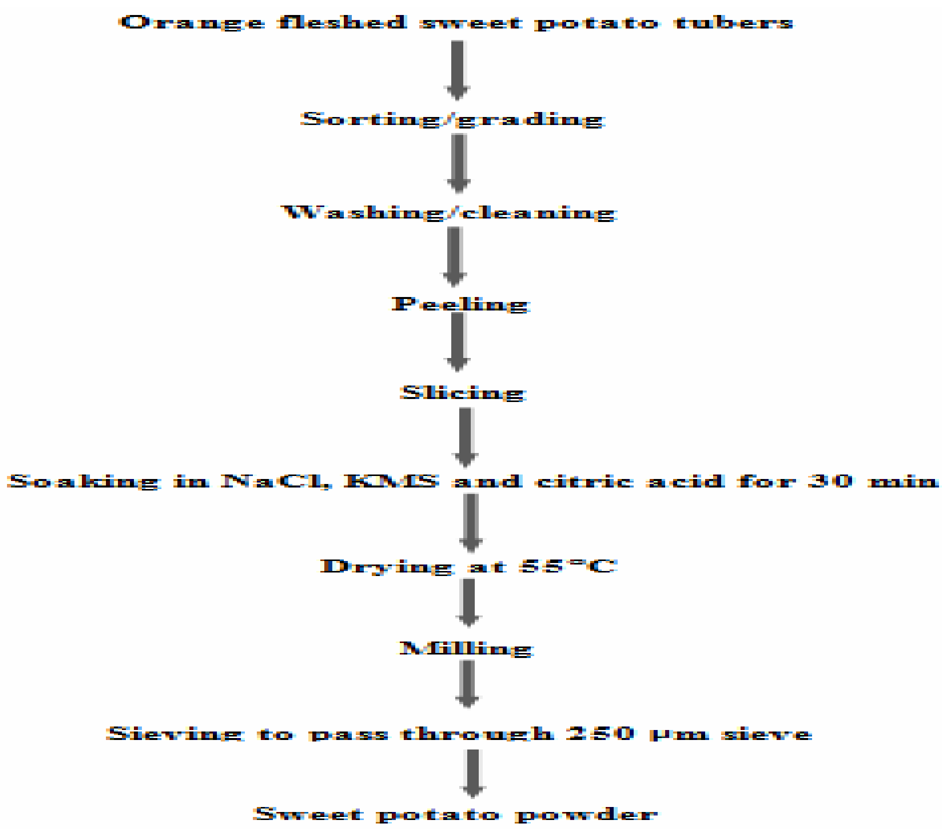

Fig. 1: A flow chart for the sweet potato powder preparation

Other five cake formula samples were prepared by replacing 10, 20,30,40 and 50% of the wheat flour in the control sample by the same amounts of sweet potato powder to prepare the tested cake treatments (namely T1 to T5) as shown in Table (1). On the other hand, the buffalo milk amounts (200 g) in the control cake treatments (T0-T5) were replaced by the same amounts of camel milk in the tested cake samples (namely T0 –T. All tested cakes were put in the oven and baked at a temperature of 180^{o}C for 20-25 min. The cakes were cooled and removed from the pan after 1hr. The cooled cake, were packaged in aluminum foils and kept until studied.

Table 1 : Ingredient amounts (in g) of the tested prepared cake formulas

Ingredients	Amounts (in g) in the tested cake formulas					
	T0 (control)	T1	T2	T3	T4	T5
Wheat flour	100	90	80	70	60	50
Sweet potato powder	0	10	20	30	40	50
Buffalo milk	200	-	-	-	-	-
Camel milk	-	200	200	200	200	200
Baking powder	10	10	10	10	10	10
Salt	0.2	0.2	0.2	0.2	0.2	0.2
Sugar	70	70	70	70	70	70
Butter	40	40	40	40	40	40
Fresh egg white	75	75	75	75	75	75
Water	35	35	35	35	35	35
Vanilla	0.75	0.75	0.75	0.75	0.75	0.75

Chemical Analysis

Proximate Composition

Moisture, ash, protein, crude fiber and fat was determined according to the method of AOAC (2010). Total carbohydrates were calculated by difference.Total calories were calculated by the formula of James (1995) as follows:

Total calories = ((4×Protein) +(4×carbohydrate) +(9×fat)).

Minerals, calcium (Ca), iron (Fe) and zinc (Zn), were determined using the Atomic Absorption Spectrophotometer (Perkin – Elmer Instrument, Model 3300, USA) as described in by AOAC (2010).

Determination of β-carotene

Beta-carotene was determined using the spectrophotometer (Spectronic 21D) according to the method described by Rodriguez-Amaya (2001).

Determination of Total Phenolic Contents

Total phenolic content was determined by the Folin–Ciocalteu micro-method according to Arabshahi-Delouee and Urooj (2007).

Determination of Antioxidant Activity

The antioxidant activity of different cake was determined using (2, 2- diphenyl-1-picrylhydrazyl (DPPH) assay according to Lee *et al.* (2003).

Sensory characteristics of cakes

After cooling for 2 hr at room temperature, the sensory characteristics of cakes were judged by ten well trained members from Experimental Kitchen Res. Unit., Food Tech. Research Institute, Giza, Egypt. They were asked to score the internal characteristics of cake samples according to AACC (2000).

Statistical analysis

Data were analyzed using SPSS (2008) software. Means and standard deviations were determined using descriptive statistics. Comparisons between samples were determined using analysis of one-way variance (ANOVA) and multiple range tests. Statistical significance was defined at $P\leq 0.05$.

Results and Discussion

Proximate Composition of raw materials

Data presented in Table (2) show lower values of protein and moisture content of sweet potato powder (either peeled or unpeeled) than wheat flour. The fat content of peeled sweet potato powder and wheat flour were 1.5% and 1.36%, respectively. Ash content of peeled and unpeeled sweet potato powder was higher than that of wheat flour which were 1.2%,5.0 and 0.34%, respectively and the carbohydrate content showed the same trend(86.2%, 89.7% and 83.7%, respectively).The unpeeled sweet potato was higher in crude fiber content than that of sweet potato powder and wheat flour. The obtained data are in agreement with those reported by Olatunde *et al.* (2016) who reported that carbohydrate, ash, fiber, protein and fat was ranged between 74.5 – 90.92, 0.15 – 2.09, 0.08 – 5.54, 0.55 – 5.87 and 0.04–1.45, respectively. These results are, also, comparable to the result reported by Jones *et al.* (2017), who reported that the carbohydrate content of wheat ranged between 65–75%, protein, 8 to 10%; fat, 1 to 2% and ash 0.4 to 1.2%. The high level of carbohydrates is desirable in baked products because when starch granules, which is important for the characteristic textures and structures of baked goods, are heating in the presence of water, it swells and foams**.**

The same Table indicated, also, that either peeled or un-peeled sweet potato powder were higher in ash, fiber, K^{+}, Ca^{++}, β-carotene, total phenol, and (2, 2- diphenyl-1-picrylhydrazyl(DPPH)content than those of wheat flour.

Table 2 : Chemical composition of the tested materials

Constituents	Wheat flour 72%	Sweet Potato Powder	
		Peeled	Unpeeled
Moisture%	11.40 ± 0.10	7.50 ± 0.10	8.40 ± 0.058
Protein*	11.00 ± 0.10	4.40 ± 0.10	4.20±0.058
Fat*	1.36 ± 0.153	1.50 ± 0.10	1.70± 0.01
Fiber*	0.70 ± 0.10	3.20 ± 0.153	5.30 ± 0.10
Ash*	0.34 ± 0.01	1.20 ± 0.10	5.10 ± 0.153
Carbohydrate*	86.60± 0.10	89.70± 0.10	83.70± 0.10
β-carotene**	0.11 ± 0.01	7.97 ± 0.01	7 ± 0.10
Total phenol**	0.423 ± 0.006	3.9 ± 0.0153	3.8 ± 0.01
DPPH %	10.6 0± 0.10	88.6 ± 0.10	85.8 ± 0.10
Fe**	1.80 ± 0.01	4.0 ± 0.10	5.2 ± 0.10
Ca**	26.50 ± 0.10	105.4 ± 1.00	106.5 ± 0.10
K**	40.00 ± 0.10	337 ± 1.00	339.6 ± 0.10

*Determined as %on dry weight basis. ** Expressed as mg/100g Total carbohydrates were calculated by difference. DPPH% Values are means of three replicates ±SD.

DPPH unpeeled sweet potato powder was 85.2%.This result is in accordance with that of Nogueira *et al.* (2018). Alloush (2015) found that thesweet potato powder contains β-carotene, Ca, K, Fe, amounts of 8.07, 111.6, 83.3 and 2.02 mg/100g, respectively. Simonne *et al.* (1993), also, revealed that sweet potato was higher in β-carotene content.

Table 3 : Chemical composition of camel milk (on dry weight).

Constituents	Camel milk
Moisture%	87.00 ± 0.10
Crude Protein g/100g	3.80 ± 0.10
Lactoseg/100g	5.28 ± 0.006
Ashg/100g	1.20 ± 0.10
Fatg/100g	2.80± 0.10
Femg/100g	3.57± 0.10
Camg/100g	99.90 ± 0.10
Znm g/100g	0.70 ± 0.10
Kmg/100g	167.00 ± 0.10
Antioxidant Activity(%)	88.00±0.10
Total phenols mg/100g	7.60± 0.10

Values are means of three replicates ±SD,

Results in Table (3) indicated that the chemical composition; moisture, crude protein, lactose,ash and fat of camel milk, were 87.00, 3.80, 5.28, 1.20 and 2.80%,respectively. The amounts of Fe, Ca, Zn and K was 3.57%, 99.90, 0.70 and 167.00 mg/100g, respectively. Antioxidant activity (%) and total phenolic compound content (as Gallic acid equivalent) were 88% and 7.6 mg/100 g, respectively. These results are in agreement with those reported by Farag *et al.* (2015), who reported that the values of protein, fat, ash, antioxidant activity (AOA) and total phenolic compound content (as Gallic acid equivalent) were 8.00, 3.80,1.20, 88.00% and 7.6 mg/100 g, respectively.

Effect of the peeled sweet potato powder and camel milk addition on the tested cakes.

Generally, results shown in Table (4) revealed that, the substitution of peeled sweet potato powder (PSPP) and camel milk significantly affected the proximate composition of cake. There were significant differences among treatments contents ($p \leq 0.05$).

Table 4 : Nutritive values of the tested cakes as a function of sweet potato powder and camel milk

Constituents	T0	T1	T2	T3	T4	T5
Moisture%	22.2^{f}±0.1	23.60^{e} ±0.11	24.61^{d} ±0.13	25.80^{c}±0.10	27.2 ^{b}±0.1	29.0^{a}±0.2
Protein*	8.60^{a}± 0.1	8.00^{b}±0.06	7.70^{c}±0.1	7.040^{d}±0.05	6.80^{e}±0.1	6.60^{f}±0.1
Fat*	20.4^{a}±0.1	19.5^{b}±0.1	19.6^{c}±0.6	19.4^{d}±0.2	19.33^{e}±0.2	19.3^{f}±0.1
Ash*	1.25^{d}±0.01	1.33^{c}±0.06	1.36^{c}±0.01	1.48^{b}±0.01	1.53^{a}±0.01	1.57^{a}±0.01
Fiber *	1.02^{f}±0.01	1.50^{e}±0.1	1.83^{d}±0.01	2.50^{c}±0.1	3.10^{b}±0.1	3.40^{a}±0.1
Carbohydrate*	68.73 ^{d}±0.1	69.67 ^{a}±0.1	69.51 ^{b}±0.01	69.58 ^{ab}±0.1	69.24 ^{c}±0.1	69.13 ^{c}±0.1
Calorie**	403^{a}±1.1	393^{b}±1.7	389^{c}±3.3	383^{d}±1.27	377^{e}±0.2	368^{f}±0.2
Fe***	8.5^{f}±0.08	9.6^{e}±0.4	14.2 ^{d} ±0.05	16.9^{c}±0.01	17.4^{b}±0.01	18.1^{a}±0.01
Ca***	49.8^{f}±0.1	132.2^{e}±0.1	149.1^{d}±0.1	155.7 ^{c}±0.1	162.2^{b}±0.1	179.9 ^{a}±0.1
K***	176 ^{f}±0.1	190 ^{e} ±0.1	206 ^{d}±0.1	238 ^{c}±0.1	283 ^{b} ±0.1	314 ^{a} ±0.1

Values are means of three replicates ±SD. Total carbohydrates were calculated by difference.
*Determined as % on dry weight basis ** Calculated as Kcal/100g on dry weight basis
*** Determined as mg/100 on dry weight basis
Each mean value, within the same row, followed by the same letters is not significantly different at 0.05 level.

Data presented in Table(4)showed an increase in moisture content in cake due to the higher content of moisture made of the peeled sweet potato powder (T5), compared with cake made from wheat flour (control, T0).On the other hand, a decrease in the protein content of cakes prepared from wheat flour (72%) blended with peeled sweet potato powder, and camel milk. The produced cake from wheat flour and peeled sweet potato powder showed a slightly lower protein content compared with the cake produced from wheat flour 100%, which could be due to its high protein content. In spite of specific amounts of butter were utilized (40 g), the fat contents of cake treatments were statistically varied and ranged between 19.3 and 20.4% concurrent with that found by Alloush (2015). It was due to the variation in fat content in the tested materials (wheat flour, sweet potato powder and camel milk). The present study, also, showed that the addition of peeled sweet potato powder and camel milk increased ash and fiber contents in all tested cakes. The highest fiber value was observed in cakes prepared with peeled sweet potation which treatment and agreed with those obtained by Abd El-Wahab(2016). Okorie and Onyeneke (2012) reported that, adding sweet potato powder at different levels (10-40%) in composite flour showed an increase in ash and crude fiber with decreases in fat and protein in both composite flour and substituted cakes. The ash and crude fiber were observed to significantly differ between cake of the control and Other treatments. However, the ash and crude fiber composition in the supplemented cake were found to be significantly higher as compared to those of the control. The highest content of fiber was recorded in sweet potato flour, which is a reflection of its composition.

It was, also, recorded that the Sweet potato flour can serve as a source of energy and nutrients (carbohydrate, β–carotene, provitamin A), and minerals (Ca, P, Fe, K, and Z) as stated by Singh *et al*. (2008) and Olatunde *et al.* (2019).Therefore, specific mineral contents of the tested cake were estimated (Table 4). It was found that the contents of Ca^{++}, K^{+} and Fe^{++} ions were highly reasonable in different tested cakes. These results revealed that in cakes with10,20,30,40 and 50% peeled sweet potato powder showed higher values of Ca^{++}, K^{+} and Fe^{++} than control cakes (peeled sweet potato powder free).

Substitution of wheat flour by peeled sweet potato powder in the tested cakes led to a reduction in the total carbohydrate content of the cake. These results are in agreement with those ofSee *et al*. (2007), Alloush (2015) and El-Bastawesy *et al*. (2015). On the other hand, energy content, showed a uniform trend of slight reductions with increasing peeled sweet potato powder across all cake treatments. Alloush (2015) reported that, substitution of wheat flour with peeled sweet potato powder led to reduction in total carbohydrate content of the cake. High fiber may be the reason for reduced calories when peeled sweet potato powder in cake treatments increased, theseare in agreement with the results of EL-Bastawesy *et al*. (2008) It was, also, found that the substitution of sweet potato flour by part of wheat flour showed a reduction in total carbohydrate content of the bread. These results are in agreement with those of See et al. (2007) andEl-Bastawesy *et al*. (2008). These results arecoincide with those of Singh *et al*. (2008), who applied similar trials in the preparation of sweet potato flour to incorporate in cookies preparation with different proportions and improvements in quality characteristics of cookies were observed.

Total phenolic compounds, β-carotene and antioxidant activity of cakes.

A further study was conducted by Siciliano *et al*. (2010) to analyze the content of total carotenoids and beta-carotene in cakes made with orange flesh sweet potato flour (OFSP). The preparation containing 40% OFSP had 2,061 mg of total carotenoids and 1,340 mg of beta carotene, both in 100 g of cake. Meanwhile, the DPPH% radical has been widely used to evaluate the free radical's scavenging the ability of various natural products and has been accepted as a model compound for free radicals originating in lipids (Da-Porto *et al.,* 2000). Antioxidant activity of sweet potato flour (SPF), as affected by simulated gastrointestinal pH conditions, is presented. All antioxidant assays conducted, concurred that the antioxidant activity of treated SPF was significantly higher ($p \leq 0.05$) than non-treated SPF. It was found that treated SPF exhibited relatively high 1,1-diphenyl-2-picrylhydrazyl radical (DPPH·) scavenging activity. Therefore, data of the β-carotene,total phenolic and DDPH% of all cake treatments under investigation were presented in Table (5). The data revealed that with increasing of substitution level of sweet potato powder, a significant increase in total phenolics, β-carotene and DDPH% were detected.

Table 5 : Total Phenolic Compounds, β-carotene and DPPH % of cakes.

Constituents	T0	T1	T2	T3	T4	T5
β-carotene*	0.75^{f} ±0.01	1.92^{e}±0.06	2.90^{d}±0.01	3.43c±0.01	3.82^{b}±0.01	4.24^{a}±0.01
Totalphenolics*	15.5^{f}±0.10	20.5^{e}±0.1	24.3^{d}±0.1	27.4^{c}±0.1	32.2^{b}±0.1	33.5^{a}±0.1
DPPH %	50.4^{e}±0.5	59.8^{d}±0.2	70.6^{c}±1.5	74.6^{b}±0.1	75.4^{b}±0.1	77.4^{a}±0.3

* Determined as mg/100g on dry weight basis. Values are means of three replicates ±SD.
Each mean value, within the same row, followed by the same letters is not significantly different at 0.05 level.

The present results indicated that an increase in β-carotene content was observed from 0.75mg/100g in T0 treatment (control cake) to 4.24mg/100g in T5 treatment cakes (50% peeled sweet potato powder substitution). These results agreed with Okorie and Onyeneke (2012). Abd-Elhak and Salem (2017) agree with our results who reported that a β-carotene content was increased to 1.87µg/100 g by addition of 20% yellow sweet potato in soup. Olapade and Ogunade (2014) stated that β-carotene content in the flours was 370 µg/100 g and sweet potato varieties were high in β-carotene.

Data presented in Table (5) show that an increase in β-carotene ranging between 0.75 and 4.42% in the cakes prepared with 10, 20, 30, 40 and 50% sweet potato powder, respectively. Burgos *et al*. (2009) found that the β-carotene content varied in the intensity of coloration of the sweet potatoes. They further indicated that the β-carotene content ranged from 0.0 to 0.4 mg/100g in cream colored sweet potatoes to 4.29 mg / 100g to 18.55mg/ 100g in deep orange colored sweet potatoes. Okorie and Onyeneke (2012) showed that β-carotene was increased by adding sweet potato in all concentration or level of substitution of cake from 5,10 and 15%.

The amount of total phenolic component (TPC) in sample cakes are higher than that of the control, which ranged between 20.5and 33.5 mg/100g, and gradually increased in cakes substituted with 10, 20,30, 40 and 50% peeled sweet potato powder, respectively. It could be due to the higher amount of TPC in peeled sweet potato powder and the low amount of TPC in wheat flour. Such results agreed with Abd El-Wahab (2016), who showed that the sweet potato flour meal contained a detectable amount of total phenolic compound (20.25 mg/g).

The radical-scavenging capability of extracts on DPPH% is a significant indicator of antioxidative activity as reported by Abdul Aziz *et al.* (2012). Therefore, DPPH% was estimated in the current study and recorded a range between 50.4 and 77.4% in the tested cakes contained 10 and 50% of peeled sweet potato, respectively.The results are in agreement with those of Sanchez *et al.* (2009) and Chan *et al.* (2012).Wherein, Chan *et al.* (2012) reported that the sweet potato is known to be rich in healthful antioxidants, and that sweet potato flour(SPF) might possess a considerable amount of bound phenolic and other antioxidative compounds. The antioxidant properties of SPF are largely influenced by pH and thus might be enhanced during the *in vivo* digestive process.

Percentages of the recommended dietary allowances (% RDA) of vitamin A provided by the tested cakes

The potential contribution of any product to improve nutrient intake depends on the age and sex of consumers, since recommended intakes differ among major categories. Based on the β-carotene level and its conversion ratio to the daily RDA of vitamin A, the results in Table (6) showed that, the percentage of RDA was higher.

Table 6 : RDA% adequacy of vitamin A for males, females and children in the tested cakes.

Treatments	Retinol content (µg /100g)	RDA% adequacy of Vitamin A for*		
		Male (of 900 µg/day)	Female (of 700 µg/day)	Children (of 400µg/day)
T0	62.5	6.9	8.9	15.6
T1	160	17.8	22.9	40.0
T2	241.7	28.9	37.2	65..0
T3	285.8	31.8	40.9	71.6
T4	318.3	35.4	45.5	79.7
T5	353.3	39.3	50.5	88.4

*Institute of Medicine (US) Panel on Micronutrients (2001)).
1 µg retinol=12 µg β-carotene = 1 µg of retinol activity.

FDA (1994) recorded that the Food and Drug Administration guidelines for nutrient content claims recommend that, a product can be considered a good source of vitamin A if it contains from 10 to 19% of the recommended daily amount, and an excellent source if it contains 20% or more of the daily value per reference amount (USI2000). The amount of Vitamin A (VA) needed from the diet depends on age, sex, and presumably on genetics and lifestyle. Recommended daily intakes of VA for healthy individuals, called "dietary reference intakes," for children of 10 to 13 years old is 600 µg RAE/day. Currently, carotenoid conversion in the body is estimated to be 6-µg β-carotene: 1-µg RAE (21) or 12-µg beta-carotene: 1-µg RAE. Considering that the daily recommendation of vitamin A to children between 10 and 13 years old (600 mcg /day) and RAE (retinol activity equivalents) by (USI 2000) is 12:1 g (β-carotene: VA), it can be concluded that a serving size of cake made with 40% OFSP (60 g^{-1} slice, according to the Brazilian legislation (AgênciaNacional de Vigilância Sanitária 2003 and 2005).

WHO/FAO (2006), recorded that the same piece of cake for the same age group can reach 22.3% of the daily needs for vitamin A. As cakes are consumed in smaller meals, such as breakfast and snacks, it is possible to suggest that the intake of up to two servings per day, taking into account the needs of other nutrients and total caloric intake. Thus, it is important to define the type of conversion to be used in calculations of portioning and labeling, as well as other relevant factors such as gender, physical activity levels, interactions with other nutrients, anti-nutritional factors that may affect the bioavailability of vitamin A.Awuni *et al.* (2017)reported that orange-fleshed sweet potato (OFSP) has the potential to improve dietary intake of vitamin A.

The results in Table (6) showed that cakes made from peeled sweet potato powder with different levels (10 and 50%) significantly higher in β-carotene content than that of control cakes. the increases of β-carotene were paralleled with the gradually substitution values on the basis of these guidelines. Hundred grams of cake made from peeled sweet potato powder with different levels were very excellent source of vitamin A for children and could be considered as a very good source of vitamin A for the both adults (male and female).

Organoleptic properties of the tested cakes

The overall acceptability is one of the most important attributes because it is associated to the textural and sensorial properties of the food. Good sensory characteristics remain a key priority as a consumer choice criterion (Noor-Aziah *et al.,* 2011). This is necessary for the development and marketing of a new product, as no laboratory test can tell whether the public will accept a new product or not (Amerine *et al.,* 2013). The result of acceptance of a food product usually indicates actual use of the product (purchase and eating). Moreover, preferences of individual consumers can be projected as vectors to suggest directions for product optimization. The mean scores of six treatments are presented in Table (7). The results showed that, sensory evaluation of the wheat (100%) cake (control sample) and sweet potato cake as a different levels substitution (10,20,30,40 and 50%) from peeled sweet potato powder and camel milk. The results revealed that the crust color of cake treatments made from wheat and peeled of sweet potato powder composite flour and camel milk was more preferable than that of the control treatments. The highest score was recorded for theT2(9.3) which having 20% sweet potato powder, followed by the T3 treatment (9.1) with 30% SPP substitution while the score of T0, control cake treatment, was the lowest (8.5) which prepared with100% wheat. This pattern happened similarly to the taste and flavor where the T2 treatment had the highest scores (9.0 and 9.2, respectively) for both sensory attributes, followed by the T3 treatment which gave 8.9and 9.3points, and the lowest points was inT0 control treatment, 8.2and 9.1, respectively. The results of flavor evaluation varies among treatments which ranged from 8.6 to 9.1. It was found that cake which was substituted with 10%,20%,30%,40% and 50% of PSPPand camel milk had non-significant difference. Generally, the results of the sensory evaluation showed that cake made from the composite flours of wheat, peeled of sweet potato powder and camel milk were more acceptable than the control one. Treatment which contained 20% peeled of sweet potato powder and camel milk had the highest scores of oragnoleptic properties. These results are contradicting with those reported by Srivastava *et al.* (2012) and Alloush (2015), but are in agreement with Dansby and Bouell-Benjamin (2003), Singh *et al.* (2008) and Abd El-Wahab (2016).

Whereby, the cake produced from wheat substituted with peeled of sweet potato powder composite flour were scored higher than the 100% wheat cakes (control) in term of all tested sensory attributes. A significant decrease in assigning scores to the sensory attributes at cake blends prepared from 40% and 50% sweet potato powder was recorded. Therefore, the sweet potato flour has been considered as a potential source of vegetable protein, fiber, and natural antioxidant for human consumption.

Table 7 : Organoleptic attributes scores of the tested cakes

Treatments	Crust Color	Taste	Texture	Flavor	Crumb Color	Appearance	Overall acceptability
T0	8.5^{b}± 0.84	8.2^{b}±1.032	9.0^{a}± 0.66	9.1^{a}± 0.73	8.9^{ab}± 0.87	9.2^{a}± 0.63	8.81^{b}± 0.40
T1	8.9^{ab}± 0.73	8.9^{ab}±0.737	8.8^{ab} ±0.63	9.0^{a}± 0.66	9.3^{a}± 0.67	9.0^{a}± 0.66	8.98^{ab}±0.19
T2	9.3^{a}± 0.67	9.0^{ab}±0.816	9.3^{a}± 0.82	9.2^{a}± 1.0	9.1^{ab}± 0.73	9.1^{a}± 0.73	9.16^{a}± 0.23
T3	9.1^{ab}± 0.73	8.9^{ab}± 0.99	9.1^{a}± 0.73	9.3^{a}± 0.67	9.20^{a}± 0.63	9.1^{a}± 0.56	9.11^{a}±0.22
T4	9.1^{ab}± 0.73	9.1^{a}±0.99	8.3^{b}± 0.94	8.7^{a}± 0.94	8.4^{b}± 0.84	8.7^{ab}± 0.94	8.716^{b}± 0.19
T5	8.8^{ab}± 0.63	9.2^{a}±0.78	8.8^{ab}± 0.78	8.6^{a}±0.96	8.6^{ab}±0.96	8.3^{b}± 0.94	8.716^{b}±0.53

Values are means of ten replicates ±SD.
Each mean value, within the same column, followed by the same letters is not significantly different at 0.05 level.

Conclusion

From the obviously results, it can be recommended that, peeled of sweet potato powder and camel milk could be successfully added as a function, natural nutrient source, with remarkable health benefits and increasing consumer acceptance. This study also revealed that peeled sweet potato powder significantly enhances β-carotene content and total phenol and anti-oxidant activity in the prepared cakes.

Conflict of Interest

The authors declared that present study was performed in absence of any conflict of interest.

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Author Contribution

All authors contributed equally in all parts of this study.

References

AACC (1983). American Association of Cereal Chemists. Approved methods of published by American association of cereal chemists Inc., St. Paul, Minnesota, USA.

AACC (2000). Approved Methods of the AACC. 10th Edition, American Association of Cereal Chemists, St. Paul, USA.

Abd El-Wahab, G.I. (2016). Utilization of Sweet Potato Flour as Natural Antioxidant to Keeping Quality of Butter Cake during Storage. Middle East Journal of Applied Sciences, 6:(4):1066-1075.

Abd-Elhak, N.A. and Salem A.A. (2017). Preparation and evaluation of dried soup produced from different sweet potato varieties. Egypt. J. Agric. Res., 95(3):1161-1177.

Abdul Aziz, N.A., Wong, L.M., Bhat, R. and Cheng, L.H. (2012). Evaluation of processed green and ripe mango peel and pulp flours (*Mangiferaindica var. Chokanan*) in terms of chemical composition, antioxidant compounds and functional properties. J. Sci. Food Agric., 92: 557–563.

Adegunwa, M.O.; Alamu, E.O.; Bakare H.A. and Oyeniyi, C.O. (2011). Proximate and bioactive contents of some selected vegetables in Nigeria: Processing and Varietal effects. Am. J. Food Nutr., 1(4): 171-177.

AgênciaNacional de VigilânciaSanitária (ANVISA) (2003). Resolução – RDC nº 359, de 23 de dezembro de.Regulamentotécnico de porções de alimentosembaladospara fins de rotulagemnutricional. [citadofevereiro de 2011].

AgênciaNacional de VigilânciaSanitária. (ANVISA). (2005). Rotulagemnutricionalobrigatória: manual de orientaçãoàsindústrias de Alimentos. 2º versão. Brasília: Ministério da Saúde, Universidade de Brasília; 2005. 44p.

Alloush, S.A. (2015). Chemical, Physical and Sensory Properties of Sweet Potato Cake. Egypt. J. Agric. Res., 93 (1):101-115.

Amerine, M.A.; Pangborn, R.M. and Roessler, E.B. (1965). Principles of sensory evaluation of food. Academic Press Inc., New York and London.

AOAC (2010). Official Methods of Analysis, Association of Official Analytical Chemists. 18th edition, Washington DC.

Arabshahi-Delouee, S. and Urooj, A. (2007). Antioxidant properties of various solvent extracts of mulberry (*Morus indica* L.) leaves. Food Chemistry, 102(4): 1233-1240.

Awuni, V.; Alhassan, M.W. and Amagloh, F.K. (2017). Orange-fleshed-sweet potato (Ipomoea batatas) composite bread as a significant source of dietary vitamin A. Food Sci. Nutr., 20:6(1): 174–179.

Berti, C.; Faber, M. and Smuts, C.M. (2014). Prevention and control of micronutrient deficiencies in developing countries: Current perspectives. Nutrition and Dietary Supplements, 6: 41–57.

Burgos, G.; Carpio, R.; Sanchez, C.; Paola, S.; Edouardo, P.; Espinoza J. and Grunerberg, W. (2009). A color chart to screen for high B-carotene in OFSP breeding. Presented at 15th International Symposium of the International Society for Tropical Root Crops (ISTRC). Roots and tubers for sustainable development and food security: Issues and strategies. November 2-6, 2009. Lima, Peru. (2009) 47-52.

Chan, K.W.; Khong N.M.H.; Iqbal, S.; Umar, I.M. and Ismail, M. (2012). Antioxidant Property Enhancement of Sweet Potato Flour under Simulated Gastrointestinal pH. Int. J. Mol. Sci., 13: 8987-8997.

Da Porto, C., Calligaris, S., Celotti, E. and Nicoli, M.C. (2000). Antiradical properties of commercial cognacs assessed by the DPPH test. J Agric Food Chem., 48(9): 4241-4245.

Dansby, M.A. and Bovell-Benjamin, A.C. (2003). Sensory characterization of a ready-to-eat sweet potato breakfast cereal by descriptive analyses. Journal of Food Science, 68(2): 706-709.

Do-Nascimento, K.D.; Lopes, D.S.; Takeiti, C.Y.; Barbosa, J.L.J.R. and Barbosa, M.I.M.J. (2015). Physicochemical characteristics of tubers from organic sweet potato roots. Revista Caatinga, Mossoró, 28(2): 225–234.

El-Bastawesy Ama1, M.; Hareedy Lobna, A. and EL-Far Mervat, M. (2008). Chemical and Technological Evaluation of Some Sweet potato Varieties. Arab Univ. J. Agric. Sci., Ain Shams Univ., Cairo, 16(1): 87-96.

Farag, S.I.; Kebary, K.M.K.; Zedan, A.N.; El-Sonbaty, A.H. and Helal, S.H.S. (2015). Impact of replacing buffaloes milk with camel's milk on the quality of domiati like cheese. Proceeding of the 12th Egypt. Conf. Dairy Sci. & Technol., Cairo, 9-11 Nov. 95-104.

Faraz, A.; Tauqir, A.N.A.; Mirza, R.H.; Ishaq, H.M. and Nabeel, M.S. (2020). Characteristics and Composition of Camel (*Camelus dromedarius*) Milk: The White Gold of Desert. Advances in Animal and Veterinary Sciences, 8(7): 766-770.

FDA (1994). Guide to Nutrition Labeling and Education Act (NLEA) requirements, Available at: http://www.fda.gov/ora/inspect_ref/igs/nleatxt. html.

Grace, M.H.; Yousef, G.G.; Esposito, D.; Raskin, I. and Lila, M.A. (2014a). Bioactive Capacity, Sensory Properties, and Nutritional Analysis of a Shelf Stable Protein-rich Functional Ingredient with Concentrated Fruit and Vegetable Phytoactives. Plant Foods for Human Nutrition, 69: 372–378.

Grace, M.H.; Yousef, G.G.; Gustafson, S.J.; Truong, V.; Yencho, G.C. and Lila, M.A. (2014b). Phytochemical changes in phenolics, anthocyanins, ascorbic acid, and carotenoids associated with sweet potato storage and impacts on bioactive properties. Food Chem.; 145: 717–724.

Institute of Medicine (US) Panel on Micronutrients (2001). Dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. Washington (DC): National Academies Press (US); 2001.

James, C.S. (1995). General Food Studies. In: Analytical Chemistry of Foods, Blachie Academic and Professional, London, New York, Tokyo.

Jones, J.M.; Peña, R.J.; Braun, H.; Guzmán, C.; Hernández-Espinosa, N.; Korczak, R. and Mollins, J. (2017). The wheat and nutrition series a compilation of studies on wheat and health. Papers published by CIMMYT and as part of a special series in Cereal Foods World, during 2014-17. CIMMYT, International Maize and Wheat Improvement Center.

Julianti, E.; Rusmarilin, H.; Ridwansyah, and Yusraini, E. (2017). Functional and rheological properties of composite flour from sweet potato, maize, soybean and xanthan gum. Journal of the Saudi Society of Agricultural Sciences, 16: 171-177.

Lee, S.C.; Kim, J.H.; Jeong, S.M.; Kim, D.R.; Ha, J.U.; Nam, K.C. and Ahn, D.U. (2003). Effect of Far-Infrared Radiation on the Antioxidant Activity of Rice Hulls. Journal of Agricultural and Food Chemistry, 51: 4400-4403.

Ndirigwe, J. (2006). Adaptability and acceptability of orange and yellow-fleshed sweet potato genotypes in Rwanda. MSc. Thesis. Makerere University, Kampala, Uganda.

Nogueira, A.C.; Sehn, G.A.R.; Rebellato, A.P.; Coutinho, J.P.; Godoy, H.T.; Chang, Y.K.; Steel, C.J. and Clerici, M.T.P.S. (2018). Yellow sweet potato flour: use in sweet bread processing to increase β-carotene content and improve quality. Anais da Academia Brasileira de Ciências, (Annals of the Brazilian Academy of Sciences) 90(1): 283-293.

Noor-Aziah, A.A.; Lee Min, W. and Bhat, R. (2011). Nutritional and sensory quality evaluation of sponge cake prepared by incorporation of high dietary fiber containing mango (*Mangiferaindica* var. Chokanan) pulp and peel flours. International Journal of Food Sciences and Nutrition, 62(6): 559- 567.

Okorie, S.U. and Onyeneke, E.N. (2012). Production and quality evaluation of backed cake from blend of sweet potatoes and Wheat flour. Part-I: Natural & Applied Sciences, Academic Research International, 3(2): 171-177.

Olapade, A.A. and Ogunade, O.A. (2014). Production and evaluation of flours and crunchy snacks from sweet potato (*Ipomea batatas*) and maize flours. International Food Research Journal, 21(1): 203-208.

Olatunde, G.O.; Henshaw, F.O.; Idowu, M.A. and Tomlins, K. (2016). Quality attributes of sweet potato flour as influenced by variety, pretreatment and drying method. *Food Science and* Nutrition, 4(4): 623–635.

Olatunde, S.J.; Ajayi, O.M.; Ogunlakin, G.O. and Ajala, A.S. (2019). Nutritional and sensory properties of cake made from blends of pigeon pea, sweet potato and wheat flours. Food Research, 3(5): 456-462.

Rodriguez-Amaya, D.B. (2001). A guide to carotenoid analysis in foods. 1st Edition, ILSI Press, Washington D.C.; USA, pp 1-59.

Sanchez, R.G.R.; Cornago, D.F. and Geronimo, I. (2009).Phenolic content and antioxidant capacity of Philippine sweet potato (*Ipomoea batatas*) varieties. Food Chem.; 113(4): 1133–1138.

See, E.F.; Wan Nadiah, W.A. and Noor Aziah, A.A. (2007). Physico-Chemical and Sensory Evaluation of Breads Supplemented with Pumpkin Flour. ASEAN Food Journal, 14: 123-130.

Siciliano, I.; Watanabe, E.; Carvalho, J.L.V.; Nutti, M.; Melo, W. (2010). Content of total carotenoids and beta-carotene in biofortified cake with orange flesh sweet potato. Brazilian Congress of Food Science And Technology, 22.; 2010, Salvador. Potentialities, challenges and innovations. [Sl]: SBCTA, 2010. http://www.alice.cnptia.embrapa.br/alice/handle/doc/875595

Simonne, A.H.; Kays, S.J.; Koehler, P.E. and Eilenmiller, R.R. (1993). Assessment of B-carotene in sweet potato breeding lines in relation to dietary requirements. J Food Compos Anal.; 6: 336–345.

Singh, S.; Riar, C.S. and Saxena, D.C. (2008). Effect of incorporating sweet potato flour to wheat flour on the quality characteristics of cookies. African Journal of Food Science, 2: 65-72.

SPSS (2008). Statistical Package for Social Sciences Program. Version 17 for Windows, SPSS Inc.; Chicago.

Srivastava, S.; Genitha, T.R. and Yadav, V. (2012). Preparation and quality evaluation of flour and biscuit from sweet potato. Journal of Food Processing & Technology, 3(12): 1-6.

van Jaarsveld, P.J.; Marais, D.W.; Harmse, E.; Nestel, P. and Rodriguez-Amaya, D.B. (2006). Retention of *β*-carotene in boiled, mashed orange-fleshed sweet potato. Journal of Food Composition and Analysis, 19: 321–329.

WHO/FAO (2006).Guidelines on food fortification with micronutrients. In L. Allen, B. De Benoist, O. Dary & R. Hurrell, (Eds.).; Guidelines on food fortification with micronutrients (pp. 1–341).