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Utilization of Sweet Potato Flour as Natural Antioxidant to Keeping Quality of Butter Cake during Storage

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ABSTRACT

Food provides not only essential nutrients required for life, but also bioactive compounds useful to maintain good health and disease prevention. The consumption of food rich in protein, fiber and antioxidants (non-nutritional components) can prevent degenerative diseases. Therefore, the aim of investigation was carried out to use sweet potato flour to prepare cake at level 10, 20, 30 and 40%, respectively to give four blends. The chemical composition and total dietary fiber fractions were determined in sweet potato flour and its blends. Total phenol and flavonoids compounds were estimated in sweet potato flour. Whilst, function properties, color measurements, sensory properties and microbiological activity were determined in butter cake as control made from 100% wheat flour 72% extraction and cake blends.The results showed that the sweet potato flour had the highest content of protein 12.71% and the blends were increased gradually by increasing sweet potato flour. Crude fiber and total dietary fiber were higher in sweet potato flour 12. 62 and 41.11% than ash content and lipids were 7.01 and 5.04%, respectively. The sweet potato flour meal had riches contained in total phenolic and flavonoids compounds 20.25 and 38.71 mg/g, respectively. Moreover, all functional properties expect fat absorption capacity and water solubility index increased significantly with increase in level of cake made from sweet potato flour. The results from color measurements observed that decline in L values signifies that with increase in percentage incorporation the lightness decreased while a and b values shows an increase in redness and yellowness in cake blends. There is no significant different were observed with regard to sensory evaluation of butter cake and its blends until 30% fortified sweet potato flour. The microbiological activity showed that the total count of bacteria and fungi were slightly increased in cake blends during the storage period (four weeks).From the obviously results it could be recommended that the sweet potato flour had the highest content of protein, crude fiber, total dietary fiber fractions and natural antioxidant as total phenol and flavonoids compounds. Therefore, fortification with sweet potato flour up to 30% to prepare butter cake gives high acceptability, safety and nutrition value.

Key words: Sweet Potato Flour, food, protein, fiber, antioxidants

Introduction

Sweet potato (*Ipomea batatas* L.) is very important vegetable crop food in many countries including Egypt. It is a member of the family Convolvulaceae, in which there are over 400 Ipomea species distributed throughout the tropics, but sweet potato is the only one of economic importance. Sweet potato is one among the two important crops: common beans and sweet potato, which help so much in the traditional foods of many countries. Beta-carotene-rich sweet potato (also known as orange - fleshed sweet potato) is one of a few new crops, which is both an excellent source of energy and important nutritive substances that can contribute to improve the nutrient status of the community (Burri, 2011).

The Sweet potato is an economical and healthful food crop containing betacarotene and substantial amounts of ascorbic acid and minerals. It is a good source of fiber which plays a favorable role in reducing blood cholesterol level. Sweet potato also contains a significant quantity of the anti-oxidant nutrients β-carotene, vitamin C and vitamin E; thus, its consumption inhibits the formation of free-radicals which have been implicated in the development of coronary heart disease (Woolfe, 1992). Both β- carotene and vitamin C are very powerful antioxidants that work in the body to eliminate free radicals. Free radicals are chemicals that damage cells and cell membranes and are

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associated with the development of conditions like other sclerosis, diabetic heart disease, and colon cancer. In addition, sweet potatoes are a good source of vitamin B6, which is needed to convert homocysteine, an interim product created during an important chemical process in cells called methylation, into other benign molecules and this helps to reduce the risk of stroke or heart attack (Lorna, 2009).

Sweet potato flour can easily be promoted as a substitute for wheat flour in sweet baked products and can also be used for its high carotenoid content. However, the price of the sweet potato flour must be competitive with wheat flour and be good quality. This article defines and describes the different quality characteristics of sweet potato flour. Flour from sweet potato can be made when prices are low early in the season and may be stored for the future. Identifying and breeding the varieties that will be suitable for different end products will enhance the production of sweet potato (Okorie, and Onyeneke, 2012).

Sweet potato flour can serve as a source of energy and nutrients (carbohydrate, β–carotene, pro vitamin A), minerals (Ca, P, Fe, K, and Z) and can add natural sweetness, color, flavor and dietary fiber to processed food products. It is also important to ensure that sweet potato-wheat based products have appropriates characteristics of appearance, aroma, taste and texture, which are key determinants of consumers' sensory acceptability of bakery products. Other sensory tests of cake products have found that replacing some basic components changes structure and volume of the crumb (Singh *et al.,* 2008) and also structure and texture.

Sweet potatoes have a number of physicochemical properties. They consist mainly of carbohydrates (80% to 90% of the dry weight of the roots), with starch being the most abundant component of the roots' dry matter forming 50% - 80% Woolfe (1992). The amylose/amylopectin ratio of sweet potato starch influences the physicochemical properties of sweet potato flour such as gelatinization, retro gradation, water absorption and pasting viscosities Collado (1999) and Black *et al.* (2000). Sweet potato contains endogenous amylolytic enzymes with the three major ones being α-amylase, β-amylase and starch phosphorylase Hagenimana *et al.* (1992). These enzymes are important for the breakdown of starch into simpler sugars during storage and processing Walter (1976). The presence of amylases in sweet potato roots influences their utilization, especially in the food industry, due to the hydrolytic effect of the enzymes on sweet potato starch which also affects the properties of the sweet potato products. For industrial use of sweet potatoes, there is need to have knowledge of their physicochemical properties and the effect that the different processing methods have on these properties and functionality of the different components. Although significant varietal differences have been documented in sweet potato physicochemical properties Nandutu *et al*. (2000) and Tsakama *et al.* (2010) there is need to assess the amylase activities of the different sweet potato varieties and evaluate their relationship with the flour characteristics and products which can possibly be processed from them. Sweet potatoes have great potential for utilization in the food industry for the production of a number of commercial products especially considering the fact that their starch content is high Woolfe (1992). It is therefore important to get an understanding of the functional properties of sweet potato in order to ascertain the appropriate uses of the sweet potatoes in food processing.

Cakes have enjoyed a relatively constant place in our diet for a long time and its continuous popularity has encouraged the development of newer and more attractive products that are available in the market today. It is often a dessert of choice for meals at ceremonial occasions, particularly wedding anniversaries and birthdays (Eke-Ejiofor *et al.,* 2008).

The current study aimed at producing and evaluating the quality properties of cake made the composite of wheat and local Egyptian sweet potato flours as a strategy to improve sweet potato utilization and improvement of smallholder income and livelihood.

Materials and Methods

Materials:

The Sweet potato *(Ipomea batata*) tuber, wheat *(Triticum aestivum*) flour, granulated sugar, vanilla essence, French butter, eggs, baking powder and powdered milk were purchased from local market in at Giza Egypt.

Methods:

Preparation of sweet potato flour:

Sweet potato (*Ipomoea batatas*) was thoroughly washed to remove dirt and soil. They were peeled, washed, blanched with 0.25% of sodium meta-bisulphate solution for 15 min, cut into slices and dried in a Gallenkamp hotbox oven at 70ºC for 18 hours. Dried sweet potato chips were milled into flour (Eke and Kabari, 2010). Flour obtained was sieved through a 60 mm mesh sieve to obtain flour of uniform particle size. The flour was then packed in an air tight container for future use flour.

Preparation of the blends:

Wheat flour 72% extraction was substituted with sweet potato flour at level 10, 20, 30 and 40%, respectively, to give four blends. These blends were kept at -20 ºC until analyses.

Proximate of chemical composition in sweet potato flour and its blends:

Protein, total lipids, crude fiber, ash content and total carbohydrates were determined in sweet potato flour and its blends using standard methods AOAC. (2005). Total dietary fiber was determined of the dried raw materials according to the methods described by Prosky (1988). Also, soluble and insoluble dietary fiber was determined with Lee and Prosky (1995).

Determination of total phenolic in raw materials:

Total phenolic contents were determined in sweet potato flour by the Folin-Ciocalteu's method (Meda *et al.*, 2005). Briefly, aliquots of 0.1 g powder of sweet potato flour were dissolved in 1mL of deionized water. This solution (0.1 mL) was mixed with 2.8mL of deionized water, 2mL of 2% sodium carbonate (Na_2CO_3), and 0.1mL of 50% Folin-Ciocalteu's reagent. After incubation at room temperature for 30min, the absorbance of the reaction mixture was measured at 750 nm against a deionized water blank using a spectrophotometer UV-vis (Jasco V-530). Gallic acid was chosen as a standard to get a seven-point standard curve (0–200 mg/L). The levels of total phenolic contents in sweet potato flour were determined using the standards curve. The data obtained from sweet potato flour was expressed as milligram of gallic acid equivalents (GAEs)/g powder and converted to milligram gallic acid equivalents (GAEs)/ g of sweet potato flour.

Determination of total flavonoids content in raw materials:

The total flavonoids content was quantified in sweet potato flour by using aluminum chloride colorimetric method described by Miliauskas *et al.* (2004). In brief, aliquots of 0.1 g of sweet potato flour were dissolved in 1mL of deionized water. This solution (0.5 mL) was mixed with 1.5mL of 95% ethyl alcohol, 0.1mL of 10% aluminium chloride hexahydrate ($AlCl_3$), 0.1mL of 1M potassium acetate (CH_3Cook), and 2.8mL of deionised water. After incubation at room temperature for 40 min, the reaction mixture absorbance was analyzed using spectrophotometer at 415 nm. The deionized water was used as a blank. Quercetin was chosen as a standard to get a seven-point standard curve (0–50 mg/L). The levels of total flavonoid contents in sweet potato flour were determined in triplicate, respectively. The data obtained from sweet potato flour was expressed as milligram of quercetin equivalents (GAE)/g.

Preparation the butter cake and its blends:

The butter cakes were produced based on the method of Chareonsinsab *et al.* (2005) and the blends are presented in Table (1)**.** The production of butter cake control is summarized as follows. French butter was beaten until it rose, the sugar was then added, the beating was continued until the butter turned white, then yolk, egg-white, milk and vanilla were added. Finally, baking powder was added and the mixture was further beaten for 5 min. The cake blends were prepared with the

obviously ingredients and fortification of the wheat flour 72% extraction with sweet potato flour at levels 10, 20, 30 and 40% to give four blends cake. The batter cake control and cake blends were transferred into 6-cm inside-diameter greased cake cups and baked at 150ºC for 25 min in an oven. The baked cakes were cooled at ambient temperature for 30 min and then packed in plastic bags and kept for further analysis.

Table 1: Ingredients of butter cake and its blends

Ingredients	Control butter cake	Cake made from sweet potato flour			
		10%	20%	30%	40%
Wheat flour 72% extraction	100	90	80	70	60
Sweet potato flour	--	10	20	30	40
Egg yolk	37.5	37.5	37.5	37.5	37.5
Egg white	37.5	37.5	37.5	37.5	37.5
White sugar	57.5	57.5	57.5	57.5	57.5
French butter	56.25	--	--	--	--
Vanilla	0.75	2.75	2.75	2.75	2.75
Skim milk	41.25	41.25	41.25	41.25	41.25
Baking powder	10.25	1.25	1.25	1.25	1.25

Sensory evaluation of cake and its blends:

Cakes were judged for cells (uniformity, size of cells and thickness of walls), grain, texture (moistness, tenderness and softness), crumb color, (taste and flavor). Sensory characteristics were evaluated by ten of panelists who had experience in evaluate cake organoleptic characteristics as described in AACC (2002). Cake samples were left to cool (32ºC) for 4hr. after backing then cake was cut and subjected to taste panel. The resulted data were statistically analyzed by analysis of variance using the General Linear Model (GLM) procedure within statistical analysis system (SAS, 1987).

Functional properties for butter cake and its blends:

Water absorption index (WAI) was measured according to Stojceska *et al.* (2009). First, 1g of butter cake and its blends were separetely placed in a previously weighed 50 ml centrifuge tube. Then, 10 ml of distilled water was added and stirred homogeneously with a glass rod and centrifuged at 3000 rpm for 10 min at room temperature (22°C) using a Model T-8BL LabyTM centrifuge (Laby Laboratory Instruments, Ambala Cantt, India). The residue was weighed together with the centrifuge tube. The WAI values were expressed as gram of water absorbed/gram of flour. The supernatant was transferred to previously weighed dish which put in hot air oven for evaporation of water. The residue was weighed. A similar method was used to measure fat absorption capacity (FAC), although a 0.5 g sample was used in this case Lin *et al.* (1974).

WAI (g/g) = Weight of residue/dry weight of residue.

WSI (%) = Weight of dry matter in supernatant x100 / Dry weight of sample.

FAC (%) = Weight of fat absorbed by sample x100 / Weight of sample.

Foaming capacity one gram of flour was dissolved in 100 ml of distilled water. Then the suspensions were whipped at a low speed in a blender for 1 min at room temperature (22°C). The resulting foam was poured into a 100 ml cylinder. Total foam volume was recorded and foam capacity was expressed as the percent increase in volume. To determine foam stability (FS), foam volume was recorded 30 min after whipping and calculated according by Kabirullah and Wills (1983).

FS = foam volume after 30 min / initial foam volume x 100

The in-vitro protein digestibility was estimated according to Akeson and Stachman (1964). One gram of dried sample was taken in a conical flask. To this, 50 ml of pepsin solution (5 gm pepsin in 0.1N hydrochloric acid) was added and incubated for 24 hours at 37 °C. The solution was then neutralized by adding 30 ml of 0.2 N sodium hydroxide and then 50 ml of pancreatin solution (4 gm pancreatin in 1000 ml of phosphate buffer of pH 8) was added and again incubated for 24 hours at 37

°C. An enzyme blank was also run under the same prescribed conditions. Few drops of toluene were used to maintain aseptic environment in the system. The contents were centrifuged at a high speed and were filtered through Whitman filter paper. The residue left was then analyzed for Nitrogen content by Micro-Kjeldhal method. The digestibility coefficient was determined by subtracting the residual protein from the initial protein on the basis of 100 gm of sample.

Color measurements for butter cake and its blends:

Color of dried cake samples were evaluated by measuring the yellowness (b value), lightness (L value) and redness (a value) using a Hunter Lab. Colorimeter model D 25 according to Francis (1998).

Microbial properties for butter cake and its blends:

The butter cake and its blends were analyzed for bacteria count and molds count according to the method of Downes and Ito (2001) during storage period at room temperature for four weeks. Plates of biological activity were incubated in incubator at 30 ^{o}C for three days.

Statistical analysis:

All chemical analyses were performed in three replicates and the results were statistically analyzed. Statistical analysis was performed using the GLM procedure with SAS (2004) software. Duncan's multiple comparison procedure was used to compare the means. A probability to $p \leq 0.05$ was used to establish the statistical significance.

Results and Discussion

Chemical analysis of sweet potato flour and its blends:

Chemical constituents and total dietary fiber fractions were determined in sweet potato flour and its blend and also, total phenolic and flavonoids compounds in ethanol extract were determined in sweet potato flour and its blend and the results are reported in Table (2). From the resultant, it could be noticed that the sweet potato flour had the highest content of protein 12.71% and the blends were increased gradually by increasing sweet potato flour from at level 10% (11.26%) to level 40% was 12.24%, respectively. The increase in protein in the blends may be caused to sweet potato was increased in protein and wheat flour 72% extraction was the highest in protein 11.90%. Crude fiber and total dietary fiber were higher in sweet potato flour 12.62 and 41.11% than ash content and lipids were7.01 and 5.04%, respectively. Whereas the sweet potato blends were increased in chemical composition and total dietary fiber fractions by increasing sweet potato flour.

Table 2: Chemical analysis of raw materials and its blends on dry weight basis

Chemical analysis	Sweet potato flour	Wheat flour 72%	Blends with sweet potato flour at level			
			10 %	20%	30 %	40 %
Protein	12.71	10.90	11.26	11.52	11.91	12.24
Crude fiber	12.62	0.95	2.65	3.84	5.07	6.24
Ash	7.01	0.52	1.13	1.85	2.56	3.12
Lipids	5.04	2.38	2.87	3.34	3.91	4.32
TC	62.62	85.25	82.09	79.45	76.55	74.08
TDF	41.11		4.35	8.14	12.85	16.43
TSDF	14.10		1.54	2.27	3.21	4.51
TISDF	27.01		2.81	5.87	9.64	11.92
Total phenolic acids (mg/g)	20.25		-	-	-	-
Total flavonoids (mg/g)	38.71		-	-	-	-

TC: Total carbohydrates TDF: Total dietary fiber TSDF: Total soluble dietary fiber TISDF: Total insoluble dietary fiber

Dietary fiber in these preparations is important due to its functional effects in the gut. For instance, viscous fiber-containing foods may elicit low postprandial glycemic responses due to delayed glucose absorp Total phenolic and flavonoids compounds in ethanol extract were determined in the sweet potato flour and the results are reported in the same table. The sweet potato flour had riches contained in total phenolic and flavonoids compounds 20.25 and 38.71 mg/g, respectively. Among the phenolic compounds with known antioxidant activity, flavonoids, tannins chalcones and coumarins as well as phenolic acids are highlighted. It is known that flavonoids are among the most potent antioxidants from plants. The excellent antioxidant activity of these substances is related to the presence of hydroxyl groups in positions 3' and 4' of the B ring, which confer high stability to the formed radical by participating in the displacement of the electron, and a double bond between carbons C2 and C3 of the ring C together with the carbonyl group at the C4 position, which makes the displacement of an electron possible from the ring B. Additionally, free hydroxyl groups in position 3 of ring C and in position 5 of ring A, together with the carbonyl group in position 4, are also important for the antioxidant activity of these compounds Sánchez-Moreno (2002). However, the effectiveness of the flavonoids decreases with the substitution of hydroxyl groups for sugars, being the glycosides less antioxidants than their corresponding aglycons Rice-Evans *et al.* (1996).
tion (Tovar *et al.,* 1992).

Functional properties for butter cake and its blends:

Functional properties as water absorption index, water soluble index, fat absorption capacity, foaming capacity and protein digestibility were determined in butter cake considerable as control and cake blends made fortified with sweet potato flour at different levels and the results are reported in Table (3). All functional properties expect fat absorption capacity and water solubility index increased significantly with increase in level of butter cake made from sweet potato flour. The results also observed that the functional properties improved because total dietary fiber content increased with increased level of sweet potato flour as these were rich in proteins. Water absorption index, foaming capacity and protein digestibility were increased with increased level of incorporation of sweet potato flour in wheat flour for cake. It has been reported that protein content had an inverse correlation with free lipid level of instant noodles Park and Baik, (2004).

Apart from their nutritional properties, the functional properties of protein and protein products must be taken into account as stated by Pour-El (1981) had broadly defined functionality as any property of a food or food ingredient except its nutritional ones that affected its utilization. The range of desirable and attractive functional properties that should be looked for is almost as broad as the range of foods themselves.

Table 3: Functional properties for butter cake and its blends:

Functional properties	Defatted sunflower	Blends with defatted sunflower at level			
		10 %	20%	30 %	40 %
WAI g/g	2.56±0.02	3.14±0.09	4.06±0.12	5.40±0.22	6.29±0.07
WSA %	3.69±0.04	4.36±0.05	3.64±0.03	3.12±0.05	2.39±0.04
FAC %	171.3±0.95	282.85±2.54	245.41±3.61	197.73±3.49	153.78±3.61
FC %	7.21±0.10	9.87±0.57	14.40±0.22	18.86±0.61	22.57±0.34
PC %	38.95±3.85	60.88±0.39	963.77±0.38	69.17±0.85	71.63±0.43

WAI: Water absorption index *WSI: Water soluble index* *FAC: Fat absorption capacity*
FC: Foaming capacity *PC: Protein digestibility*

Color measurements of butter cake and its blends

The results obtained were show in Table (4). There was a decrease in L values for oil cake blends prepared with sweet potato flour from 37.62 to 34.81. Butter cake prepared from sweet potato flour Srivastava *et al.* (2010) concluded that decreasing L and increasing a and b values lead to darkening of biscuits when they supplemented virgin coconut meal in biscuits. Decline in L values signifies that with increase in percentage incorporation the lightness decreased while a and b values shows an increase in redness and yellowness in cake blends. Similar trend was observed in corn and

potato flour Singh *et al.* (1996) virgin coconut meal Srivastava *et al.* (2010) in biscuits. Thus observed results in this study followed similar trends. The color development is contributed by the Millard reaction that results in brown color Singh *et al.* (1993). Other factors that may be responsible for color development are time and temperature of baking, composition and humidity in oven Lingnert (1990). It was reported that with an increase in protein content there is a decrease in L value Gallagher *et al.* (2005). In the cake blends significant difference was observed for all L, a and b values.

Table 4: Effect of incorporation sweet potato flour on the color (L, a, b values) of butter cake and its blends.

Blends	L	a	b
Control	49.11±1.54	4.30±0.06	11.20±0.42
10%	37.62±1.39	1.12±0.75	1.34±0.85
20%	38.05±0.84	1.49±0.08	2.88±0.36
30%	35.53±0.26	2.34±0.03	0.21±0.18
40%	34.82±0.32	3.15±0.04	3.77±0.16

Sensory characteristics of butter cake and its blends:

Effect of Incorporation of sweet potato flour on the sensory scores butter cake as control and cake blends. The results concerning sensory evaluation of cake blends produced from different levels of sweet potato flour used are shown in Table (5).

Table 5: Sensory properties of butter cake and its blends

Types of additions	Taste 20	Odor 20	Texture 15	Crust color 15	Crumb color 15	General appearance 15	Overall acceptability 100
Control	19.30^{a} ±1.06	19.20^{a} ±0.93	14.35^{a} ±0.97	14.78^{a} ±0.74	14.89^{a} ±0.61	14.89^{a} ±0.99	97.43
10%	18.12^{ab} ±0.09	19.10^{a} ±0.63	14.22^{a} ±0.97	14.24^{a} ±0.74	14.30^{a} ±0.72	13.91^{b} ±0.04	93.89
20%	17.57^{b} ±0.23	18.00^{b} ±0.12	14.35^{a} ±0.28	13.65^{b} ±0.48	13.68^{b} ±0.09	14.31^{a} ±0.67	91.56
30%	18.45^{ab} ±0.56	17.50^{c} ±0.13	13.63^{b} ±0.66	12.90^{c} ±0.11	13.60^{b} ±0.55	14.05^{a} ±0.99	90.13
40 %	17.15^{b} ±0.21	17.62^{c} ±0.35	13.85^{b} ±0.35	12.31^{c} ±0.34	12.18^{c} ±0.87	13.34^{b} ±0.43	86.45

It could be noticed that butter cake treatments made from 100% wheat flour (extraction 72%) was characterized with high acceptability for all parameters. There is no significant different were observed with regard to sensory evaluation (taste, odor, texture, crust color, crumb color, general appearance and overall acceptability) of butter cake and its blends and it is still acceptable in previous parameters as compared to the control cake but it was liked mildly by the panel members. Significant decrease in assigning scores to the sensory attributes at cake blends prepared from 40% sweet potato flour. Therefore, the sweet potato flour has been considered as a potential source of vegetable protein, dietary fiber and natural antioxidant for human consumption. The blend flavor, light color and absence of antinutritional factors or allergenic compounds have prompted the utilization of the butter cake for human consumption (Gandhi *et al.,* 2008).

Biological activity in butter cake and its blends:

Microbiological spoilage is often the major factors limiting the shelf life of bakery products. Spoilage from microbial growth causes economic loss for both manufacturers and consumer. These losses could be due to many individual cases such as, packaging, sanitary practice in manufacturing, storage conditions and product turnover (Saranraj and Geetha, 2012).
Biological activity as total bacteria and fungi count were estimated in butter cake and its blends at level 10, 20, 30 and 40% respectively, during storage period for four weeks and the results are reported in Table (6). The results showed that the total count of bacteria and fungi were slightly

increased in cake blends during the storage period. Total count of bacteria for cake blends at level 40% made from sweet potato flour was ranged from 32.2×10^{-3} CFU in butter cake control to 47.6×10^{-3} CFU in cake blends after four weeks and the total count of fungi was parallel to the bacteria count. Butter cake prepared from sweet potato flour products is good sources of protein, total dietary fiber and natural antioxidant and the results obtained from microbial analysis of cake blends product show that there no variation was obtained during storage period.

Mold growth is by far the major factor limiting shelf life of high and intermediate bakery products. In general, mold growth on bakery products is a serious problem that results in economic losses. Furthermore, losses of products due to mold spoilage are between 1 and 5 percent depending on the type of product, season, and the method of processing (Malkki and Rauha, 2000).

The antioxidant activity of food phenolic compounds is of nutritional interest, since it has been associated with the potentiating of the promoting effects of human health through the prevention of several diseases Lampe (1999). Additionally, in some cases, these compounds may also be used with therapeutic purposes due to their pharmacological properties Percival (1998). Many phenolic compounds with low molecular weight, such as thymol, are used in medicine as antiseptic due to its toxicity Harborne (1980). However, the antioxidant activity of phenolic compounds depends largely on the chemical structure of these substances Scalbert and Williamson (2000).

Table 6: Total bacteria and fungi count in butter cake made from peanut during storage period

Blends	Total bacteria count × 10^{-3} CFU			Total fungi count × 10^{-2} CFU		
	Zero time	Two weeks	Four weeks	Zero time	Two weeks	Four weeks
Control	18.7	21.5	32.2	29.5	36.9	37.4
10%	19.1	22.2	39.9	33.8	44.6	47.1
20%	19.5	24.3	42.1	34.1	47.2	50.1
30%	19.8	25.4	45.4	35.3	47.5	51.9
40%	20.7	27.2	47.6	37.9	50.1	52.4

Conclusion

This work revealed that the utilization of sweet potato flour in baking merits attention and it could be concluded that the sweet potato flour had the highest contained from protein, crude fiber, total dietary fiber fraction and natural antioxidant as total phenol and flavonoids compounds. Therefore the substitution of wheat flour with sweet potato up to 30% (flour basis) indicated that cakes baked with composite wheat flour improved their sensory attributes, safety and high nutritional value.

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