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QUALITY EVALUATION OF CAKE FROM WHEAT, BAMBARA GROUNDNUT (*Vigna subterranean*) and VELVET TAMARIND (*Dalium guineense*) FLOUR BLENDS

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ABSTRACT
The increasing nutritional awareness of consumers has necessitated investigations into the incorporation of nutrient dense underutilized crops such as Bambara groundnut and velvet tamarind into baked products. This study was aimed at assessing the suitability of different proportions (80:15:5, 75:20:5. 70:25:5, 65:30:5) of wheat, bambara groundnut, velvet tamarind composite flours for cake production with 100% wheat flour as the control. The functional properties of the composite flours were evaluated and the cakes were analyzed for physical, proximate, mineral and sensory properties using standard methods. There was no significant difference ($p>0.05$) in the bulk densities and swelling index between the composite flours (up to 25% substitution) and the control. The water absorption capacity (WAC), gelatinization temperature and time of the flour samples increased (0.85 to 1.10 %, 69.50 to 80^{o}C and 1.47 to 12.41s respectively) with increase in bambara groundnut flour substitution. Likewise the weight of the cake samples while the height and oven spring reduced with increase in bambara groundnut flour. The protein, ash, calcium, sodium and potassium content of the cake samples increased (7.69 to 12.70%, 1.99 to 2.36%, 20.50 to 31.30 mg/100g, 216.79 to 278.36 mg/100g and 548.55 to 836.92 mg/100g respectively) with inclusion of bambara groundnut and tamarind flour. The sensory properties of the cake samples were adversely affected by inclusion of bambara groundnut and velvet tamarind however they were still acceptable. The study concludes that production of cake from wheat/bambara groundnut/ velvet tamarind composite flour enhanced the nutrient content of the product and hence should be encouraged.

Keywords: Composite flour, Cake, Bambara groundnut, Velvet tamarind, Nutrients

INTRODUCTION
Consumption of confectioneries has become very common in Nigeria as a result of urbanization. Wheat is the main source of flour for baked products due to the unique properties of its protein (gluten) (Potter and Hotchkiss, 2006; Olaoye *et al*., 2015). Unfortunately, Nigerian climate does not favour wheat production hence a lot of foreign exchange is spent annually on the importation of wheat to meet the flour requirements of the baking industry (Kiin-Kabari and Eke-Ejiofor, 2013). This has triggered research efforts towards partial substitution of wheat flour with flours from locally available, underutilized crops in Nigeria that are more nutrient dense (Olaoye *et al.*, 2006; Olaoye and Onilude, 2008; Olaoye and Ade-Omowaye, 2011). Legume proteins are rich in lysine and deficient in sulphur containing amino acids while cereals like wheat are deficient in lysine but contains adequate amounts of sulphur containing amino acids (Gomez *et al*, 2008). Hence a combination of both will provide a balance of the essential amino acids.
Bambara groundnut (*Vigna subterranean*) is an indigenous Nigerian crop that is rich in protein (14 - 24 %), fat (5.5 ‐ 6%), ash (2.8 ‐ 4.4%), crude fiber (3.3 ‐ 4.4%), carbohydrates (54.5 - 69.3 %), calcium (260mg) and phosphorus (380 mg/ 100 g) with a good balance of essential amino acids and relatively high proportion of lysine (6.6 %) and 1.3 % methionine (Abu-Salem and Abou-Arab, 2011; Oyeyinka et al., 2018). This legume has the potential to impact on the nutritional profile of confectioneries if incorporated into wheat flour due to its high nutritive value however, it is underutilized.
Velvet tamarind (*Dalium guineense*) is an indigenous fruit that contains some essential minerals and vitamins such as magnesium, potassium and vitamins A and C. The pulp flour has been reported to possess desirable physicochemical and sensory properties which make them useful raw material which can be incorporated in foods as flavor and to reduce micro nutrient deficiencies (Arogba *et al*., 2006). The presence of antioxidants and vitamin C make them ideal food additive to boost the body's immunity level and help in the prevention of cancer (Besong *et al*., 2016). The tannin content of velvet tamarind has been reported to be responsible for its cardio protective property (Lawrence *et al*., 1997). The fruit pulp contains over 13% of dietary fiber which increases bulk and facilitates bowel movement (Besong *et al*., 2016).
Several studies have been reported on the supplementation of wheat flour with flours from locally available crops such as African yam bean, tigernut, Moringa and chickpea aimed at achieving better essential amino acid balance, reducing protein energy malnutrition and micronutrient deficiencies, improving organoleptic property and reducing wheat importation [Obasi *et al*, (2012); Ade-Omowaye *et al*., (2008); Nwakalor, (2014); Gomez *et al*., (2008)]. However, there is relative paucity of information on the effect of partial replacement of wheat flour with bambara groundnut and velvet on the quality of cake. The use of these flours for production of baked goods can lower the dependency on imported wheat, reduce cost and improve the nutritive value of the baked products. The aim of this study therefore is to evaluate the suitability of incorporating bambara groundnut and tamarind flour in cake production and its implication on the nutrients and sensory characteristics of the cake.

MATERIALS AND METHODS
Sample Preparation
Velvet tamarind fruits, bambara groundnut, wheat and other materials such as sugar, butter, baking powder and eggs used for the study were purchased from Ndoro market in Ikwuano L.G.A, Abia State, Nigeria. All reagents were of analytical grade. Wheat grains were sorted, washed (in water), drained, dried (in oven at 60 ºC for 8 hours), milled (attrition mill),

sieved (100 µm mesh screen diameter), packaged in an airtight polyethylene bag for further use (Ndife *et al*., 2014). Sorted bambara groundnut seeds were soaked in tap water (1:2 w/v) for 24 hours at room temperature, manually de-hulled by rubbing between the palms, dried in the hot air oven at 50 ^{o}C for 19 hour, milled with attrition mill, sieved (100 µm mesh screen), packaged in an air tight container and stored prior to further use (Adegbanke and Ayomiposi, 2019). The method described by Mbaeyi-Nwaoha and Onwe (2019) was used in the production of velvet tamarind flour. Velvet tamarind fruits (2kg) were manually shelled and deseeded. The resulting pulp was dried using cabinet drier at 50 ^{o}C for 6 hours, milled and sieved (100 µm mesh screen) to obtain velvet tamarind flour which was packaged in a plastic container and stored prior to further use.

Flour characterization

Functional properties

The tapped bulk density was determined according to the method of Kaur and Singh (2007). Flour (1.5g) was weighed into a 10mL graduated cylinder and continuously tapped on the table until there was no further reduction in level of the sample and the bulk density was calculated as weight of sample per volume of sample (g/mL). Gelatinization temperature was determined as the temperature at which gelatinization was observed when 10% suspension of sample in test tube was heated at 100 °C for 10 minutes (Onwuka, 2018). Water absorption capacity was determined using the method 56-20 of AACC (2000) where 10mL of distilled water was added to 1g of flour in a weighed centrifuge tube, thoroughly mixed and allowed to stand for 30mins at room temperature. After which it was centrifuged at 2000 x g for 10 min and the supernatant decanted. The WAC was calculated as the difference between the initial and final weights after the water has been decanted. Swelling index was calculated as the ratio of the swollen volume to the original volume of a unit weight of the flour. One (1) gram of the flour sample was weighed into a clean dry measuring cylinder and the original height was recorded before 5 ml of distilled water was added to the sample and left to stand for 1 hour, and the swollen volume was recorded (Onwuka, 2018). All the determinations were done in three replicates.

Production of Cake

The flour used for cake production was from blends of Wheat, Bambara groundnut and velvet tamarind flour. The composite flour formulations are shown in Table 1. The 100 % wheat flour cake was used as the control.

Table 1: Formulation of Flour blends

Wheat Flour(%)	Bambara Groundnut Flour(%)	Velvet Tamarind Flour(%)
80	15	5
75	20	5
70	25	5
65	30	5
100	0	0

The ingredients used for the cake production include; flour (400 g), sugar (250 g), margarine (250 g), eggs (300 g), baking powder (10 g) and salt (5 g). The quantities used were determined from preliminary studies. The method of Alozie and Chinma (2015) was adopted for the preparation of cake. The margarine and sugar were creamed in a mixer (5KSM150PS, KitchenAid, St Joseph, MI, USA) for 10 min until light and fluffy. The eggs were beaten for 3 min and added to the creamed mixture gradually and beating continued. Flour samples from various composite blends were separately sieved, with salt and baking powder and gradually folded into the mixture until a soft consistency batter was formed. The batter was transferred to a greased baking pan and baked in a preheated oven at 200 °C for 30 minutes, after which it was turned out and allowed to cool for 2 hours before analysis.

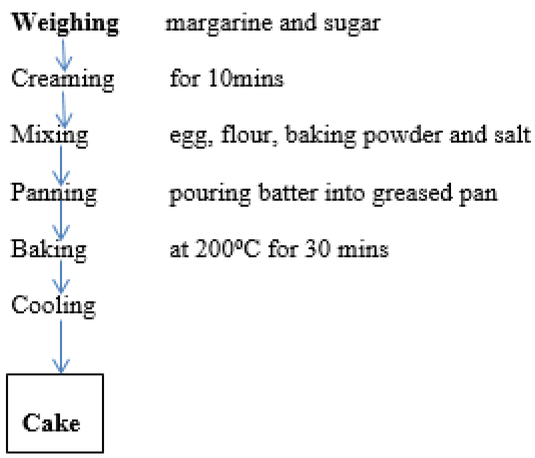

Figure 1: flow diagram for the cake production

Cake Characteristics

Physicochemical Properties

The weight of the cake was determined on a weighing scale. The height of the batter and cake were measured using a ruler. The oven spring was obtained by subtracting the difference between the height of the baked cakes and the height of the batter before baking according to Shittu *et al.* (2008). The proximate composition of the cake samples which include the moisture, crude protein, ash, crude fat and fibre was carried out using the methods of AOAC (2019).

Mineral analysis

Mineral composition such as calcium (Ca), magnesium (Mg), sodium (Na) and potassium (K) were determined using wet-acid digestion method for multiple nutrients determination (AOAC, 2019).

Sensory Evaluation

The cakes prepared from wheat flour and the composite flours were subjected to sensory evaluation using twenty semi-trained panelists. Sensory parameters which include appearance, taste, aroma, texture, and general acceptability were scored using a 9-point hedonic scale (Iwe, 2002) ranging from 1 (dislike extremely) to 9 (like extremely).

Statistical analysis

All analysis was carried out in triplicates for all determinations and the results were expressed as mean of the triplicate determinations. The SPSS 21.0 for windows computer software package was used for one way analysis of variance (ANOVA) and the means were separated using the Duncan's multiple range tests.

RESULTS AND DISCUSSION

Flour Characterization

Functional properties of the flour samples

The result of the functional properties of the flour samples is presented in Table 2. There was no significant difference ($p>0.05$) between the bulk densities of the composite flours (up to 25% substitution with bambara groundnut flour) and that of 100 % wheat flour. However, 30 % bambara groundnut substitution significantly decreased (0.82 to 0.78 g/ml) the bulk density of the flour samples. Although velvet tamarind flour was added, its effect couldn't have been significant ($p>0.05$) since the same quantity was added to all the composite flours. Bulk density is a measure of heaviness of a flour sample (Oladele and Aina, 2009). The bulk density range (0.78 to 0.82 g/ml) observed in this study compared favourably with 0.42 to 0.93 g/ml earlier reported by Apotiola and Fashakin (2013) on wheat, yam and soybean flours. Inclusion of Bambara groundnut and velvet tamarind did not significantly affect the bulk density of the flours except in the sample with 30% bambara groundnut inclusion that the bulk density significantly ($p<0.05$) reduced to 0.78 g/ml. The water absorption capacity (WAC) of the flour samples increased (0.85 to 1.10 %) with increase in bambara groundnut flour inclusion. This could be attributed to the increase in protein content as proportion of bambara groundnut increased which provided more water binding sites. Water absorption capacity is the ability of flour to absorb water and swell for improved food consistency (Osundahunsi *et al*., 2016). The WAC range (0.85 to 1.10 %) observed in this study is similar to 0.47 to 1.10 % reported by Omah and Okafor (2015) for flour blends from wheat and pigeon pea. The result suggests that the flour samples may find application in baked products such as cakes, cookies etc. There was no significant difference ($p>0.05$) in the swelling index between the composite flours (up to 25% inclusion of bambara groundnut flour) and 100% wheat flour. However, at 30% inclusion of bambara groundnut flour, the swelling index (1.24) was significantly reduced. High swelling capacity has been reported as part of the criteria for good quality products (Apotiola and Fashakin, 2013). The gelatinization temperature and time of the samples increased (69.50 to 80^{o}C and 1.47 to 4.41s respectively) with increase in bambara groundnut flour. The increase in gelatinization temperature could be due to substitution of part of the wheat starch with a different kind of starch and some hydrophilic substances from bambara groundnut and velvet tamarind. This suggests that substitution of wheat with bambara groundnut flour could increase the energy and time requirement for cooking foods that contain these flours and this could be a problem in developing countries where the cost of energy is high.

Table 2: Functional properties of the wheat, bambara groundnut and velvet tamarind flour samples

Wheat : Bambara: tamarind flour	Bulk density (g/ml)	WAC (%)	Gelatinization temperature (^{o}C)	Gelatinization time (Sec)	Swelling index
80:15:5	$0.82^{a}\pm0.01$	$0.90^{b}\pm0.07$	$72.50^{b}\pm0.71$	$2.20^{c}\pm0.01$	$1.63^{a}\pm0.00$
75:20:5	$0.80^{ab}\pm0.00$	$1.05^{ab}\pm0.07$	$72.50^{b}\pm2.12$	$3.21^{b}\pm0.03$	$1.56^{a}\pm0.04$
70:25:5	$0.80^{ab}\pm0.01$	$1.05^{ab}\pm0.07$	$77.50^{a}\pm0.71$	$3.38^{b}\pm0.02$	$1.53^{a}\pm0.00$
65:30:5	$0.78^{b}\pm0.00$	$1.10^{a}\pm0.00$	$80.00^{a}\pm1.41$	$4.41^{a}\pm0.13$	$1.24^{b}\pm0.02$
100:0:0	$0.82^{a}\pm0.01$	$0.85^{b}\pm0.14$	$69.50^{b}\pm0.71$	$1.47^{d}\pm0.11$	$1.65^{a}\pm0.03$

Values are the means of three replicate determinations ± standard deviations. Means with different superscripts in a column are significantly ($p<0.05$) different.

Physical Properties of the Cake Samples

The result of the physical properties of the cake samples is presented in Table 3. It was observed that the weight of cake samples from the composite flours were higher than the control. This implies that, addition of bambara groundnut flour in cake production increased the weight of the cake samples. This could be related to the increase in water absorption capacity of the composite flours. The oven spring of the cake from 100% wheat flour was significantly ($p<0.05$) higher than that of the other cake samples. Oven spring and height of the cakes reduced with increase in bambara groundnut flour, this could be due to the dilution of the gluten in wheat flour by substituting it with bambara groundnut flour, hence the gas generated during the baking process could not be effectively retained leading to reduced height and oven spring and a dense cake (Ayoade *et al*, 2020).

Table 3: Physical properties of the cake samples

Wheat:bambara nut:tamarind flour	Weight (g)	Height (cm)	Oven spring
80:15:5	$93.55^{d}\pm0.36$	$3.75^{b}\pm0.07$	$1.35^{b}\pm0.07$
75:20:5	$96.58^{c}\pm0.70$	$3.30^{c}\pm0.00$	$1.20^{bc}\pm0.07$
70:25:5	$99.93^{b}\pm1.85$	$3.15^{c}\pm0.07$	$1.13^{bc}\pm0.07$
65:30:5	$108.56^{a}\pm0.01$	$3.05^{c}\pm0.07$	$1.00^{c}\pm0.00$
100:0:0	$80.79^{e}\pm0.69$	$4.65^{a}\pm0.07$	$1.85^{a}\pm0.07$

Values are the means of duplicate determinations ± standard deviations. Means with different superscripts in a column are significantly ($p<0.05$) different.

Proximate Composition of the Cake Samples

The result of the proximate composition of the cake samples is presented in Table 4. The moisture content of the samples increased (20.57 to 25.88 %) with increase in bambara groundnut flour inclusion while the control (100 % wheat cake) had the lowest moisture content (20.57 %). This could be related to the higher WAC of flours with increase in bambara groundnut flour inclusion. The moisture content observed in this study compares with 19.20 to 22.40 % and 21.10 to 23.22 % reported by Kiin-Kabari and Banigo (2015) and Eke-Ejiofor (2013) for cakes from wheat and unripe plantain enriched with bambara groundnut and African breadfruit and sweet potato-wheat cake respectively. High moisture content has been reported to reduce the shelf life of baked products, as they support microbial proliferation that leads to spoilage (Akhtar *et al*., 2008; Elleuch *et al*., 2011).

The protein content of the samples increased (7.69 to 12.70%) with increase in bambara groundnut flour inclusion. Similar increases in protein content with inclusion of legume flours has been reported by Singh *et al*. (2000); Awadelkareem *et al*. (2008) in sorghum-soy composite flour and Ndife *et al*., (2011) in wheat-soyabean composite. This could be due to the high protein content of 17.5 - 21.2% and 20.27- 23.63% reported by Onimawo *et al*., (1998) and Abdulsalami and Sheriff, (2010) respectively for bambara groundnut. This suggests th0at the consumption of cake from wheat: bambara groundnut: tamarind composite flour can enhance the protein intake of the consumer and help reduce the problem of protein malnutrition among the vulnerable groups.

Inclusion of bambara groundnut and velvet tamarind increased the ash content of the cake samples from 1.99% (in 100% wheat cake) to 2.38% (in 65 % wheat: 30 % bambara: 5% velvet tamarind cake). Velvet tamarind has been reported by Okudu *et al*. (2017) and Asoiro *et al*., (2017) to be rich in minerals. Bambara groundnut is also rich in calcium and phosphorus (Oyeyinka *et al*., 2018). This could have contributed to the increase in ash content observed in the cakes from the composite flours as ash content is an indication of the amount of minerals that are present in the cakes.

The crude fiber content of the cake samples from the composite flours were significantly higher than that of the control and increased (0.59 to 0.87 %) with increase in bambara groundnut flour inclusion up to 30 % level of substitution. The increase in fibre content could be as a result of high fibre content of bambara groundnut (5.5%) and velvet tamarind (2.2%) as reported by Khan *et al*., (2021) and Achoba *et al*., (2007). The increased fiber content is beneficial for bowel movement. The fat content of the cake samples with bambara groundnut and velvet tamarind inclusion were also higher than that of the control and it ranged from (19.89 – 22.91%).

Carbohydrate content of the cake samples ranged from 37.26 % (in 65 % wheat: 30 % Bambara: 5% velvet tamarind flour blend) to 47.24% (in 100% wheat flour). The carbohydrate content was significantly reduced with inclusion of bambara groundnut and velvet tamarind as both flours have been reported to have less carbohydrate than wheat flour (Oppong *et al*, 2015; Abu-Salem and Abou-Arab, 2011; Besong *et al*., 2016). A similar observation was made by Arise *et al.* (2020) who reported a decrease in carbohydrate (64.20 to 55.20 %) content as a result of increased bambara groundnut inclusion for snacks produced from wheat-fermented bambara groundnut flour. Carbohydrate is a good source of energy for the human body activities (Ibeanu *et al*., 2016).

Table 4: Proximate composition of the wheat, bambara groundnut and velvet tamarind cake samples

Wheat: bambara nut: tamarind	Moisture (%)	Protein (%)	Ash (%)	Fiber (%)	Fat (%)	Carbohydrate (%)
80:15:5	$22.22^{c}\pm0.04$	$8.61^{e}\pm0.03$	$2.17^{b}\pm0.00$	$0.61^{bc}\pm0.06$	$20.63^{bc}\pm0.39$	$42.22^{bc}\pm0.51$
75:20:5	$22.90^{c}\pm0.15$	$9.02^{d}\pm0.02$	$2.11^{bc}\pm0.01$	$0.69^{b}\pm0.04$	$21.71^{b}\pm0.79$	$41.57^{c}\pm0.57$
70:25:5	$24.84^{b}\pm0.25$	$10.78^{c}\pm0.28$	$2.36^{a}\pm0.15$	$0.75^{b}\pm0.13$	$22.10^{ab}\pm1.11$	$42.17^{b}\pm0.81$
65:30:5	$25.88^{a}\pm0.62$	$12.70^{a}\pm0.04$	$2.38^{a}\pm0.01$	$0.87^{a}\pm0.01$	$22.91^{a}\pm1.12$	$37.26^{b}\pm0.45$
100:0:0	$20.57^{d}\pm0.08$	$7.69^{b}\pm0.18$	$1.99^{c}\pm0.01$	$0.59^{c}\pm0.06$	$19.89^{c}\pm0.93$	$47.24^{a}\pm0.88$

Values are the means of duplicate determinations ± standard deviations

Mineral composition of the cakes

The result of the mineral composition of the cake samples is presented in Table 5. From the result, the composite flours had higher calcium than the control. Calcium content of the cake samples from the composite flours significantly ($p<0.05$) increased as the proportion of bambara groundnut flour in the cakes increased ranging from 20.50 (100% wheat flour) to 31.30 mg/100 g (65 wheat flour: 30 bambara groundnut: 5 tamarind flour and 100% wheat flour). The observed increase was attributed to high calcium content of both bambara groundnut (260mg) and velvet tamarind (49mg/100g) as reported by Abu-Salem and Abou-Arab, (2011) and Achoba *et al*, 1992) respectively. Calcium is essential for proper bone and teeth formation (Li *et al*., 2016).

The sodium content of the cake samples increased (216.79 to 278.36 mg/100 g) with increase in bambara groundnut inclusion. The sodium value (216.79 to 278.36 mg/100 g) obtained in this study was higher than the range of 1.60 to 2.29 mg/100 g reported by Kiin-Kabari and Banigo (2015) for cakes from wheat and unripe plantain enriched with bambara groundnut. Sodium intake needs to be monitored as it can become a major dietary cause of high blood pressure and other related ailments. The potassium content of the cake samples from the composite flours (628.57 - 836.92mg/100g) was significantly higher than that of the control (548.55mg/100g). Velvet tamarind has been reported by Niyi (2015) to be rich in potassium; this explains the higher potassium content of samples with velvet tamarind flour.

Table 5: Minerals composition of the flour samples

Wheat:Bambara nut: tamarind	Calcium (mg/100g)	Sodium (mg/100g)	Potassium (mg/100g)
80:15:5	$24.60^{b}\pm1.00$	$245.58^{c}\pm0.31$	$628.57^{c}\pm0.04$
75:20:5	$27.75^{ab}\pm0.35$	$264.22^{b}\pm0.74$	$744.57^{b}\pm1.22$
70:25:5	$29.55^{a}\pm0.35$	$265.57^{b}\pm0.04$	$754.31^{b}\pm0.66$
65:30:5	$31.30^{a}\pm0.00$	$278.36^{a}\pm0.06$	$836.92^{a}\pm2.38$
100:0:0	$20.50^{c}\pm0.00$	$216.79^{d}\pm0.05$	$548.55^{d}\pm0.21$

Values are the means of duplicate determinations ± standard deviations

Sensory evaluation of the cake samples

Table 6 shows the sensory evaluation of the cake samples. There was significant difference ($p < 0.05$) in the appearance of the samples with the appearance of the control significantly higher than that of cakes from the composite flours. It was observed that the inclusion of bambara groundnut and velvet tamarind flours decreased the appearance, taste, aroma, texture and general acceptability of the cake samples. The decrease in the taste of cakes from the composite flours may be attributed to a combination of the beany flavour from bambara groundnut flour and the sour taste of velvet tamarind. The control (100 % wheat cake) was generally more preferred than the other cake samples. This implies that bambara groundnut and tamarind flour substitution into wheat flour reduced the sensory properties of the cake samples however, the least preferred (80%wheat:15% bambara groundnut:5% velvet tamarind) was neither liked nor disliked.

Table 6: Sensory evaluation of the wheat: bambara groundnut: tamarind flour cake samples

Wheat:bambara nut: tamarind flour	Appearance	Taste	Aroma	Texture	General acceptability
80:15:5	$5.70^{c}\pm1.45$	$5.25^{c}\pm1.21$	$5.40^{c}\pm1.14$	$5.50^{c}\pm1.32$	$5.45^{c}\pm1.15$
75:20:5	$6.10^{c}\pm1.12$	$5.60^{c}\pm1.27$	$5.70^{c}\pm1.42$	$5.95^{bc}\pm1.19$	$6.05^{c}\pm1.15$
70:25:5	$6.90^{b}\pm1.12$	$6.75^{b}\pm1.37$	$6.70^{b}\pm1.13$	$6.60^{b}\pm1.43$	$7.15^{b}\pm1.04$
65:30:5	$7.05^{b}\pm1.19$	$7.05^{ab}\pm1.73$	$6.40^{b}\pm1.19$	$6.75^{b}\pm1.33$	$7.15^{b}\pm0.93$
100:0:0	$8.05^{a}\pm0.89$	$7.80^{a}\pm1.20$	$7.90^{a}\pm1.02$	$7.75^{a}\pm1.29$	$8.20^{a}\pm0.95$

Values are the means of duplicate determinations ± standard deviations

CONCLUSION

This study has revealed that bambara groundnut and velvet tamarind flour inclusion enhanced the functional properties of the composite flours as well as the proximate and mineral composition of the cake samples although the physical and sensory properties were adversely affected. The enhanced protein content resulting from increased bambara groundnut flour inclusion implies that the cakes from the composite flours can enhance the protein intake of the consumer which can subsequently reduce the problem of protein-energy malnutrition among the vulnerable groups. Hence production of cake using wheat, bambara groundnut and velvet tamarind flour, composite should be encouraged. More research needs to be carried out on the anti-nutritional factors and shelf life of cakes from the composite flours as well as investigating ways of enhancing the physical and sensory properties of the cakes.

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