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Influence of Using a Mixture of Rice and Maize Flour Fortified With Date Paste and Peanuts on Some Quality Characteristics of Gluten Free Cake

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Abstract: *The effect of supplementation wheat flour with a mixture of maize and rice flour fortified with date paste and Sudanese peanuts on some quality properties of gluten free cake was investigated. Three samples of gluten free cake* ***A*** *(66.6% rice flour with 33.3% starch flour),* ***B*** *(33.3% rice flour with 66.6% starch flour) and* ***C*** *(50% starch flour and 50% rice flour) were manufactured. The results of the chemical analysis showed that the highest mean value of moisture was (43.0%) in the cake sample A containing (66.6% rice flour and 33.3% maize starch flour), while the highest mean value for the protein content was (11.1%) in the sample B with (33.3% rice flour and %66.6 maize starch flour), in addition to the highest mean value of fat content recorded (6.3%) in the sample cake containing C (50% starch flour and 50% rice flour). The fiber content (0.9%) in both samples A and B, also the ash content (0.9%) was recorded in the sample A. The type of flour and mixing ratios significantly (P≤0.05) affected the amount of moisture, protein, fat, and ash except for the fiber content. The results revealed that the highest content of calcium (221.0 g/100 mg), phosphorus (241.7 g/100 mg), iron (0.91g/100 mg grams) was recorded in sample* ***C*** *(50% starch flour and 50% rice flour), while the highest content of potassium was (245.1g /100 mg) in sample* ***A****. The results of the microbial analysis showed that the mean value of the total number of bacteria was recorded less than (≤10). No fungi and yeasts were found in all the samples of gluten free cake. The results of the sensory evaluation of the gluten-free cake samples showed that the sample* ***B*** *(33.3% rice flour with 66.6% starch flour) was the best significant in appearance (4.6) and texture (3.37), and the overall acceptability (3.47), while* ***A*** *(66.6% rice flour with 33.3% starch flour) was the best in taste (4.0) and flavour (3.71). The study recommended using a smaller percentage of corn flour and a higher percentage of rice flour to make gluten-free cake, and the cake can be fortified with date paste, peanut butter and other types of legumes to raise the nutritional value of the product.*

Keyword: Gluten Free Cake, Rice and Maize Flour, Date Paste and Peanuts, Quality Characteristicsr.

Introduction

Cake is a popular bakery product consumed for its palatable taste. The main ingredients used in cake production include wheat flour, margarine, eggs, sugar and baking powder. Among the different ingredients used in the production of cake, wheat flour constitutes a major component. Wheat flour, the major raw material for cake production, is deficient in lysine, an essential amino acid (Jaganathan, 2016).

There have been several attempts to incorporate bran from various sources into cereal products as a high protein and fibre source. Many researchers (Mikki et al., 1983; Hamad and Yousif, 1986; Hussin, 1995) have re-ported experimental utilization of dates in different products (such as bakery products). It was found that replacement of sucrose by date paste in bread and cookies would improve their nutritional value by increasing levels of both minerals and vitamins. Most of the date sugars are invert sugar resulting in increasing the bread and cookie softness However, the utilization of date powder in bakeries and food products has not been reported (Hoseney, 1986; Gamal et al., 2012). The previous study evaluated of nutritional quality of cake supplemented with peanut butter and found that, sensory evaluation study concluded greater acceptability of cake by sensory evaluation panel member when vanaspati was substituted by 40 per cent peanut butter (Sweta and Gajera, 2014).

Study problems: Gluten free products have been characterized by relatively low nutritional value because they contain limited amounts of proteins and fiber (Ziobro et al., 2013).

Justification: There have been several attempts to incorporate bran from various sources into cereal products as a high protein and fibre source. Cereal products lack essential amino acids and other macro and micro nutrients that are needed to improve their nutritional values.

Objectives

✓ To evaluate the effect of using a mixture of rice flour and maize corn flour with date and peanut pastes on the chemical and minerals quality of free gluten cake products ✓ To evaluate the effect of supplementation of rice flour with date and peanut pastes on the sensory properties of free gluten cake products

To assess the nutritional value of free gluten cake enriched with date and peanut pastes.

Materials and methods

Materials

The materials used in this study were Rice flour, maize flour butter, Baking powder, Egg, sugar, vanillin flavour, Salt and yoghurt. All were obtained from local markets. Date and peanuts paste: was purchased from the Perfumery stores.

Methods

Preparation of composite flour blends

The first steps, all ingredients mentioned above were weighed and then 4 eggs were whipped with 100g sugar till changed into white colour and expanded. Then, it was mixed 250g yoghurt, 300butter, 10g liquid vanillin, 1g salt and 10baking powder and maize flour| rice flour were added with different levels A, B and C. The cake dough was poured on a baking sheet in temperature 230C, and then steamed for 35 minutes see (Table 1- 3).

Cake samples formula:

Table (1 - 3) Ingredients recipe in cake samples (A, B and C)

Item	A	B	C
Rice flour	400g	200g	300g
Corn flour	200g	400g	300g
Yoghurt	250g	250g	250g
Date past	50g	50g	50g
Peanut	25g	25g	25g
Sugar powder	100g	100g	100g
Butter	300ml	300ml	300ml
Egg	4	4	4
Baking powder	10g	10g	10g
Salt	3g	3g	3g
Vanillin	10ml	10ml	10ml

Chemical analyses of gluten free cake samples

Moisture content, protein content, fat content, fibers, ash content were determination was conducted using the AOAC method (2000).

Minerals content: Minerals content (Ca, k, P and Fe) were determined according to Atomic Absorption Spectrometer (Perkin, 1994).

Microbial parameters

Enumeration of total bacteria: The method described by Houghtby *et al*., (1992) was used from each dilution 1ml samples were aseptically transferred in to sterile ptri dishes in duplicate, following by adding 10 - 12 ml of standard plate count agar at 45- 46 c˚. The ptri dishes was converted and mixed by gentle rotation to allowed to solidified. The plate were inverted and incubation at 37 c˚ for 48 hours. The developed colonies were counted using colony counter, plates 25- 250 or less than 25 colonies were selected. The average number of colonies in each dilution was multiplied the reciprocal of the dilution factor and record as colony forming units/g.

Enumeration of yeast and mold: The method described by Frank, *et al*., (1992) was used. One milliliter from each dilution was carefully transferred into ptri dished using sterile pipettes, and then added 10- 12 ml of yeast extract agar into plates. It was mixed by gentle rotation and incubated at 25 c˚ for days. The developed colonies was counted using colony counter and plate counting 15 - 150 colonies in each dilution were multiplied by the reciprocal of the dilution factor and recorded as per gram.

Sensory evaluation: Ten trained panelists from the Department of Food Science Technology, AL-Zaeim AL-Azhari University, were chosen to judge on the quality of gluten free cake in term of appearance, flavour, texture and overall acceptability. The sensory evaluation of gluten free cake was evaluated by scoring procedure described by (Ihekorone and Negoddy, 1985).

Statistical analysis: The statistical analysis was performed using SPSS (2007). Data generated were subjected to version 9.2 issued in 2014 by Microsoft Corporation, and then means were separated using DMRT as reported by Montgomery (2001).

Results and discussion

Chemical composition of gluten free cake

Moisture content: Table 1 shows the moisture content of gluten free cake product (P≤ 0.05). The highest mean value of moisture content was recorded (43.0%) in sample **A** containing 33.3% maize flour 66.6% rice flour, flowed 40.0%) by sample **B** contenting 66.6% maize flour, while the lowest showed in samples **C** (38.5%) containing 100% rice flour. Similar studies with Shinde *et al*., (2019) showed that, the average moisture content of date paste bread of all treatments and replications was 37.61 percent, the moisture content of bread increase with increase in level of date paste. Asimah *et al*., (2016) stated that, the moisture content of gluten free cake with 100g rice flour and 50g peanut past was 14.48%.

Gadallah, (2017) observed that wheat and sorghum flours had significant ($p \leq 0.05$) high in moisture content being 13.16% and 12.82%, respectively. On the other hand, used rice flour was containing lower moisture content 8.50%.

The result showed less than Man *et al*., (2014) who studied the preparation and quality evaluation of gluten-free biscuits made with different flour and stated that, the moisture content of the gluten-free biscuit sample ranged between 10.15% and 10.85%. In general the moisture content of rice flour was 12.6%, while corn flour was 10.6% (Yalçin *et al*.,

2008). Gadallah, (2017) observed that wheat and sorghum flours had significant ($p \leq 0.05$) high in moisture content being 13.16% and 12.82%, respectively. On the other hand, used rice flour was containing lower moisture content 8.50%.

The moisture content of rice sponge cakes with different concentration of Basil seed gum ranged from 16.1 to 18.2% (Salehi *et al*., 2017).

Generally Low-moisture bakery products, such as crackers, biscuits, and breadsticks, are generally characterized by long life on the shelves due to their low water activity. However, during storage, quality decay occurs due to a loss of crispness upon moisture adsorption or development of lipid oxidation (Galic´ *et al*., 2009).

Protein content: Results in Table 1, illustrated the highest protein of gluten free cake (11.1%) in samples **B** containing 66.6% maize (corn) flour and 33.3% rice flour, flowed (9.7%) by sample **A** contenting 33.3% maize flour and 66.6% rice flour, while the lowest showed (8.6%) in samples **C** with 50g maize (corn) flour and 50 % rice flour (P≤ 0.05). The highest protein content was obtained in formulation in samples containing 25g Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour cracker biscuits (9.73%) due to presence of wheat protein (Jothi *et al*., 2014).

Similar studies with Shinde *et al*., (2019) showed that, the average protein content of date paste bread at 3, 5, 7 percent level was 7.42, 7.60, 7.77 respectively from above table shows that the protein content increased with increase in level of date paste.

Asimah *et al*., (2016) stated that, the protein content of gluten free cake with 100g rice flour and 50g peanut past was 16.33%.

The result showed approximately with Man *et al*., (2014) who studied the preparation and quality evaluation of gluten-free biscuits made with different flour and stated that, the protein content ranged from 18.03% to 21.00%. In general the protein content of wheat flour was 13.0%, rice flour was 5.9%, while corn flour was 6.9% (Yalçin *et al*., 2008). Also the protein content of rice flour showed 2.00 mg|30g was reported by USDA, (2019).

Fat content: Data in Table 1 shows that the fat content of cake product was (6.3%) in samples **C** containing 50% maize (corn) flour and 50% rice flour, flowed (5.6%) by sample **A** contenting 33.3% maize (corn) flour a 66.6% rice flour, while the lowest showed (4.7%) in samples **B** with 66.6% maize (corn) flour a 33.3% rice flour (P≤ 0.05). The result showed less than Man *et al*., (2014) who studied the preparation and quality evaluation of gluten-free biscuits made with different flour and stated that, the fat content varied from 13.56% to 20.35%; these values are within the acceptable limits for biscuits given by the Romanian settlement STAS 1227-3/90. Asimah *et al*., (2016) stated that, the fat content of gluten free cake with 100g rice flour and 50g peanut past was 33.71%.

In general the fat content of wheat flour was 1.23%, rice flour was 1.27%, while corn flour was 0.92% (Yalçin *et al*., 2008). The increased fat content could be attributed to the high fat content in maize Similar result was reported by (Begum *et al*., 2013). This value was less than that obtained by Malmomo *et al*., (2011), who found fat content of 2.60%. Also the results were lower than those reported by Eltinay, (1979) and Elshewaya, (2003) and Elsayed, (1999) who found fat contents were 3.25%, 3.37%, 4.68% respectively, for two Sudanese Maize (corn) cultivars (Tabat, Feterita).

Gadallah, (2017) found that, the protein content in rice flour was 9.56 % and 8.38% in Sorghum flour as gluten free flour.

Ash content: Data in Table 1 shows that the ash content of cake product was (0.9%) in samples **A** contenting 33.3% maize (corn) flour a 66.6% rice flour, flowed (0.8%) by sample **C** contenting 50% maize flour and 50% rice flour, while the lowest showed

(0.5%) in samples **B** with contenting 66.6% maize (corn) flour a 33.3% rice flour ($P \leq$

0.05).

In general the ash content of wheat flour was 0.52%, rice flour was 0.49%, while corn flour was 0.38% (Yalçin *et al*., 2008). Other studies with Shinde *et al*., (2019) showed that, the average bread containing 7 percent date paste (3.63 percent) and lowest in treatment to i.e. control (2.19 percent).

Asimah et al., (2016) stated that, the ash content of gluten free cake with 100g rice flour and 50g peanut past was 1.35%. Similar effects were observed in sweet biscuits containing gluten free in samples containing 25g Gluten-free wheat flour and 35g rice

flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour had the highest ash (2.93%). This variation might be due to high amount of Bengal gram (20%) that contained high amount of ash (3.71%).

The increased ash content could come from both maize and sweet potato which are reported to contain high minerals. Similar result was reported by (Begum et al., 2013).

The results were similar with results reported by Hussien et al., (1976) who found 1.34%, and 1.84%. In addition, these values are in agreement with previous study by Elsayed, (1999), who reported value ranged from 1.5 to 2.0 % and 1.5% to 1.8 %, respectively. But not far from that by Shephered et al., (1970) and Yousif,2000 and Magboul (1972) who found that ash content value 1.1 to 1.9% and1.1%- 2.7 % respectively. This result was higher than (1.90%) which reported by AbouAzm, (1982). However was higher than result of Mohsen et al., (1997) (1.2 %) and also higher than that result 1.18% which reported by Eladawy, (1995).

Germinated chickpea flour showed significant ($p \leq 0.05$) increase in ash (3.10%) followed by 2.58% which given by sorghum flour, while rice flours was contained lower amounts of ash being 0.44% (Gadallah, 2017). The ash content of rice sponge cakes with different concentration of Basil seed gum ranged from 0.39 to 0.40% (Salehi et al., 2017).

Fiber content: Results in Table 1, illustrated the highest fiber of gluten free cake (0.9%) in both samples A and B, while the lowest showed (0.8%) in samples C with 50g maize (corn) flour and 50 % rice flour ($P \leq 0.05$).

The higher dietary fiber was obtained in formulation samples containing 25g Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour 2.36% that me be due to high amount of Italian millet flour 15% that contained higher amount of dietary fiber 5.65% (Jothi et al., 2014). Asimah et al., (2016) stated that, the fiber content of gluten free cake with 100g rice flour and 50g peanut past was 1.58%.

Mustafa and Magdi (2003) reported that the crude fiber of three cultivars Hamra Shahla and Baidha were 2.26, 1.71 and 1.90% respectively. The fiber content of two Maize (corn) cultivars Wad Ahmed and Tabat were 2.7 and 2.3% respectively results showed by Abdelrahman et al., (2005). Saleh et al., (2013) found that, the increase in fiber could also be attributed to the maize and sweet potato flours which are reported to be high in both nutrients (Van Hal, 2000; Mis, 2000). Gadallah, (2017) found that, the fiber content of gluten-free flours rice flour was 0.50% and 3.51% in Sorghum flour.

Table (1) Effect supplementation different type flour on chemical composition of gluten free cake

Item	A	B	C
Moisture*	43.0 ± 0.36^{a}	40.3 ± 0.31^{b}	38.5 ± 0.6^{bc}
Protein*	9.7 ± 0.11^{b}	11.1 ± 0.16^{a}	8.6 ± 0.05^{bc}
Fat% *	5.6 ± 0.14^{ab}	4.7 ± 0.1^{c}	6.3 ± 0.05^{a}
Fiber% **	0.9 ± 0.04^{a}	0.9 ± 0.05^{a}	0.8 ± 0.01^{ab}
Ash*	0.9 ± 0.02^{a}	0.5 ± 0.1^{c}	0.8 ± 0.02^{ab}

* Mean values ± SE within the row having different superscripts letters are significantly different ($P \leq 0.05$).

* *Mean values ± SE within the row having different superscripts letters are not significantly different ($P \geq 0.05$).

A ≡ Sample with {66.6% Rice flour and 33.3% Maize (corn) flour}

B ≡ Sample with {33.33% Rice flour and 66.6% Maize (corn) flour}

C ≡ Sample with {50% Rice flour and 50% Maize (corn) flour}

Minerals content of gluten free cake

Calcium content: Table 2 shows the highest calcium content of gluten free cake product (P≤ 0.05). The highest mean value of calcium content was recorded (221.0 mg|100g) in sample **C** containing 50% maize flour 50% rice flour, flowed (218.2 mg|100g) by sample **A** contenting 33.3% maize flour and 66.6% rice flour, while the lowest showed in samples **B** (38.5%) containing 66.6% maize flour and 33.3% rice flour.

Calcium is one of the most challenging minerals to reach the recommended daily intake, which validates the use of alternative calcium food sources such as beans, in its traditional form of consumption.

Other studies with Shinde et al., (2019) stated that the mineral matter of bread increased due to the addition of bread which contain 2.1 percent mineral, hence it was seen that bread become nutritious. Taco, (2011) who found that calcium content was higher than wheat cake (94.91mg|100g), while cake with 45% split bean flour was (108.63 mg|100g). Ascheri, (2006) reported similar value of calcium in rice bran flour (6.49mg.100g-1). For the bean flours, calcium contents of RBF and EBF were within reported values (30 to 240 mg·100g-1 for RBF and 63 to 123 mg·100g-1 for EBF) (Gomes, 2006, Nikmaram et al., 2017). Kenawi et al., (2016) who found that, the calcium content of biscuit fortified with 30% date powder of Tamr El wadi was 43.57mg|100g it's higher than the control biscuit sample 29.83mg|100g.

Table (2) Effect supplementation different type flour on minerals composition of gluten free cake

Item	A	B	C
Calcium**	218.2±3^{ab}	212.4±6abc	221.0±7.1^{a}
Potassium*	245.1±6.8^{a}	241.5±6.4^{ab}	226.3±6.7^{c}
Phosphorus*	190.3±4^{b}	181.3±9.5^{bc}	241.7±6.3^{a}
Iron*	0.3±0.02^{b}	0.9±0.06^{a}	0.9±0.06^{a}

* Mean values ± SE within the row having different superscripts letters are significantly different (P≤ 0.05).

* *****Mean values ± SE within the row having different superscripts letters are not significantly different (P≥ 0.05).

A ≡ Sample with {66.6% Rice flour and 33.3% Maize (corn) flour}

B ≡ Sample with {33.33% Rice flour and 66.6% Maize (corn) flour}

C ≡ Sample with {50% Rice flour and 50% Maize (corn) flour}

Potassium content: Data in Table 2 shows that the highest potassium content of cake product was (245.1 mg|100g) in samples **A** contenting 33.3% maize (corn) flour a 66.6% rice flour, flowed (24.5 mg|100g) by sample **B** contenting 66.6% maize (corn) flour a 33.3% rice flour, while the lowest showed (226.3 mg|100g) in samples **C** with contenting

50% maize flour and 50% rice flour (P≤ 0.05).

Kenawi *et al*., (2016) who found that, the potassium content of biscuit fortified with 30% date powder of Tamr El wadi was 173.00mg|100g it's higher than the control biscuit sample 129.65mg|100g. The increased potassium content of cake sample may be due to the increased potassiumin date, USDA, (2020) reported that, the potassiumcontent of fresh date paste showed 760 mg|100g

Phosphorus content: Data in Table 2 shows that the highest phosphorus content of cake product was (241.7mg|100g) in samples **C** contenting 50% maize flour and 50% rice flour, flowed (190.3mg|100g) by sample **A** contenting 33.3% maize (corn) flour a 66.6% rice flour, while the lowest showed (181.3 mg|100g) in samples **B** 66.6% maize (corn) flour a 33.3% rice flour (P≤ 0.05). Kenawi *et al*., (2016) who found that, the phosphorus content of biscuit fortified with 30% date powder of Tamr El wadi was 159.53 mg|100g it's higher than the control biscuit sample 149.49 mg|100g. The increased phosphorus content of cake sample may be due to the increased potassium in date, Eltom, (2007) reported that, the phosphorus content of fresh date paste showed 0.123 mg|100g **Iron content:** Data in Table 2 shows that the highest iron content of cake product was (0.9 mg|100g) in both samples **B** with 66.6% maize (corn) flour a 33.3% rice flour and **C** contenting 50% maize flour and 50% rice flour, while the lowest showed (0.3mg|100g) in sample **A** contenting 33.3% maize (corn) flour a 66.6% rice flour (P≤ 0.05).

Iron values obtained for wheat flour 1.44 mg.100g^{-1} was higher than corn starch 0.29 mg.100g^{-1}, while cake with 45% split bean flour was 2.61mg|100g (Taco, 2011), but still very low, which in wheat flour case justifies the need for a regulatory standard for product fortification with iron. Kenawi *et al*., (2016) who found that, the iron content of biscuit fortified with 30% date powder of Tamr El wadi was 3.04 mg|100g it's higher than the control biscuit sample 1.81 mg|100g.

Microbial analysis of gluten free cake

Total variable count of Bacteria cfu/g: The results showed that the highest total variable count of bacteria cfu/g in gluten free cake samples was (≤10) in all samples A, B and C were investigated (Table 3).

Yeast & mould cfu/g: The results showed that the highest Yeast & mould cfu/g in gluten free cake samples was (Nil) in in all samples A, B and C were investigated (Table 3). LAB and yeast Yeast numbers of A were between 1.2x103 and 3x103 CFU/g, while LAB were between 1.6x109 and 4x109 CFU/g. The A was produced using multi-stage spontaneous fermentation. More than 50 species of LAB, especially belonging to the genus Lactobacillus, and more than 20 species of yeasts, mostly belonging to the genera Saccharomyces and Candida, have been found in sourdough for making traditional leavened bakery products (Minervini et al., 2012; Lattanzi et al., 2013). These data are consistent with another study which showed dominating microorganisms in spontaneously fermented doughs. The homofermentative Lactobacillus and Pediococcus have been found both in wheat and rye sourdoughs at a level of 3x108 – 3x109 CFU/g (Tulbek, 2006).

Table (3) Effect supplementation different type flour on total bacterial count cfu/g and Yeast & mould cfu/g of gluten free cake

Item	A	B	C
Total bacterial count cfu/g	≤ 10	≤ 10	≤ 10
Yeast & mould cfu/g	Nil	Nil	Nil

*Mean values ± SE within the row having different superscripts letters are significantly different (P≤ 0.05).

A ≡ Sample with {66.6% Rice flour and 33.3% Maize (corn) flour}

B ≡ Sample with {33.33% Rice flour and 66.6% Maize (corn) flour}

C ≡ Sample with {50% Rice flour and 50% Maize (corn) flour}

Sensory proprieties of gluten free cake

Appearance: With respect to the organoleptic evaluation of the gluten free cake produced, the best appearance score 4.6 was shown in sample **B** containing 66.6% maize (corn) and 33.3% rice flour ($p < 0.05$), flowed 4.0 by sample **C** containing 50% maize (corn) flour and 50% rice flour, while the worst score recorded 3.7 in sample **A** containing 33.3% maize (corn) and 66.6% rice flour (Table 4).

However, there was a variation in general acceptability among Maize (corn) flours substitution levels. The control had a higher acceptability score compared to all Maize (corn) flours substitution. In general (Yalçin *et al*., 2008) stated that corn and rice are suitable for a wide range of food applications and they can be processed into a number of pleasant, nutritious food products. The higher L* values of corn and rice samples indicate that they have brighter colour than that of wheat.

Pancakes prepared at incorporation rates of 20%, 30% and 40% are all acceptable in terms of colour and spongy appearance. Pancake with 30% of date pomace powder was the most preferred (Messaoudi and Fahloul, 2018).

Jothi *et al*., (2014) found that, the cracker biscuits were subjected to sensory evaluation by a panel of 60 tasters. Among all type cracker biscuits, the color of samples containing 25g Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour was the most preferred one. sensory rank sums and paired comparison test of regional and 305 hybrid maize varieties within each colour (white or yellow type) showed the preference of 306 regional maize varieties in detriment of hybrids (22.0 vs 14.0 in the case of yellow types 307 and 20.0 vs 16.0 in the case of white types). Our results disagree with those reported by Miñarro *et al*., (2010) who observed that rice-flour breads had lower brightness values and that they were therefore less white than breads made with starches. These differences may be due to the higher protein content of dough made with rice flour than dough made with starches and therefore to a greater colour development through Millard reactions.

Texture: The best texture score in gluten free cake samples was shown 3.3 in both samples **B** containing 66.6% maize (corn) and 33.3% rice flour and **C** containing 50% maize (corn) and 50% rice flour ($p \geq 0.05$), while the worst score recorded 1.4 in sample **A** containing 33.3% maize (corn) and 66.6% rice flour (Table 4).

Texture analysis for all brown rice-peanut paste cake formulations and the control sample showed significant differences in Hardness as described by the maximum breaking strength of the cake product. Total replacement of margarine with peanut paste significantly improved the texture (Asimah *et al*., 2016). Pancakes prepared at incorporation rates of 20%, 30% and 40% are all acceptable in terms of size of alveoli and spongy appearance (Messaoudi and Fahloul, 2018).

Jothi *et al*., (2014) found that, texture of cracker biscuit of samples containing 25g

Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and

15g Italian millet flour was most preferred and significantly better than all the other cracker biscuit containing gluten-free composite flour

In addition, the incorporation of wheat starch into gluten free bread formulations was found to improve the specific volume and increased the cell density of breads made with rice flour than those of maize starch breads (Mancebo *et al*., 2015).

Changes in the internal structure of the cake product might have contributed to this observation. Mancebo *et al*., (2016) observed a decreased in hardness when proteins were added to cookies consistent with results of Hadnadev *et al*., (2011) who substituted rice flour with buckwheat flour with higher protein content.

Taste: Table 3 shows the taste of the gluten free cake produced, the best taste score 4.0 was shown in sample **A** containing 33.3% maize (corn) and 66.6% rice flour ($p < 0.05$), flowed 3.7 by sample **B** containing 66.6% maize (corn) flour and 33.3% rice flour, while the worst score recorded 3.0 in sample **C** containing 50% maize (corn) and 50% rice flour (Table 4).

Among all the type of cracker biscuits, the taste of samples containing 25g Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour cracker biscuit was the most preferred one than all the other the cracker biscuit containing gluten-free composite flour. With respect to overall acceptability, control biscuits containing only 100% wheat flour and S cracker biscuits were equally acceptable and significantly better than other type (Jothi *et al*., 2014).

Pancakes prepared at incorporation rates of 20%, 30% and 40% are all acceptable in terms of taste (Messaoudi and Fahloul, 2018).

In addition, the incorporation of wheat starch into gluten free bread formulations was found to improve the of breads made with rice flour resulting in higher scores for the taste and acceptability than those of maize starch breads (Mancebo *et al*.,2015). As light bitter taste at a 50% or greater replacement level of whole Maize (corn), flour may be due to the phenolic compound and tannins found in the seed- coat (Siddeeg *et al*., 2017). It should be realized that the preference, according to taste, differs from one region in the Sudan to another (Kyomugisha, 2002).

Flavour: Table 4 shows the flavour score of gluten free cake with Maize (corn) flour and rice flours there was not significantly ($p \geq 0.05$) different. The best flavour score 3.7 was shown in both samples **A** containing 33.3% maize (corn) and 66.6% rice flour and

B containing 66.6% maize (corn) and 33.3% rice flour ($p < 0.05$), while the worst score recorded 3.4 in sample **C** containing 50% maize (corn) and 50% rice flour.

Jothi *et al*., (2014) found that, among all type cracker biscuits, the flavour of samples containing 25g Gluten-free wheat flour and 35g rice flour, 20g Bengal gram flour, 5g potato flour and 15g Italian millet flour was the most preferred one.

Pancakes prepared at incorporation rates of 20%, 30% and 40% are all acceptable in terms of odor (Messaoudi and Fahloul, 2018).

Overall acceptability: Table 4 shows the overall acceptability score of gluten free cake not significant affected by maize (corn) and rice flour ($p \geq 0.05$). The best overall acceptability score was shown 3.4 in sample **B** containing 66.6% maize (corn) and 33.3% rice flour, flowed 3.47 by sample **A** containing 33.3% maize (corn) flour and 66.6% rice flour, while the worst score recorded 3.3 in sample **C** containing 50% maize (corn) flour 50% rice flour (Table 3).

Sweta and Gajera, (2014) who investigated the evaluation of nutritional quality of cake supplemented with peanut butter found that sensory evaluation study concluded greater acceptability of cake by sensory evaluation panel member when Vanaspati was substituted by 40 per cent peanut butter. Asimah *et al*., (2016) stated that, the cake products with partially replaced margarine rated better in taste and overall acceptability than formulations in which margarine was totally replaced with peanut paste.

Pancakes prepared at incorporation rates of 20%, 30% and 40% are all acceptable in terms of colour, homogeneity of distribution, odor, taste, size of alveoli and spongy appearance. Pancake with 30% of date pomace powder was the most preferred (Messaoudi and Fahloul, 2018). Man *et al*., (2014) concluded that gluten-free biscuits can be made by mixing different non-wheat flours such as: rice flour, maize flour and soy flours. The blend with flour levels 30:30:40 (maize flour: rice flour: soy flour) led to the highest acceptability. Among the experimental gluten free cracker biscuits, the cracker biscuit containing 25% rice flour, 45% gluten-free wheat flour, 15% Bengal gram flour, 10% potato flour and 5% Italian millet flour was the favorite sample concerning sensory evaluation with the highest overall acceptability followed by S and S cracker biscuits containing gluten-free composite flour (Jothi *et al*., 2014).

Similar with Mancebo *et al*., (2015) who stated that, the highest value for sensorial acceptability corresponded to the bread produced with a mixture of rice flour (59 g/100 g) and wheat starch (41 g/100 g). Aljahani and and Al-Khuarieef, (2017) who studied the effect of mixing wheat flour with pumpkin and dates on the nutritional and sensory characteristics of cake stated that the utilization of fruits in food preparation that require a sweet taste is a wise strategy to reduce the added sugar intake.

Moreover, colour appeared to be a very important criterion for initial acceptability of the cakes by the consumer. The development of food products with attractive colors has been a major goal in the food industry. In a study by El-Demery, (2011), higher levels of pumpkin powder produced toasted bread with improved.

Table (4) Effect supplementation different type flour on sensory properties of gluten free cake

Item	A	B	C
Appearance*	3.7±0.2c	4.6±0.1a	4.0±0.2b
Texture**	3±0.2ab	3.3±0.2a	3.3±0.3a
Taste*	4.0±0.2a	3.7±0.2b	3.0±0.3c
Flavour**	3.7±0.2a	3.7±0.2a	3.4±0.3ab
Overall acceptability**	3.4±0.2a	3.47±0.2a	3.3±0.3ab

* Mean values ± SE within the row having different superscripts letters are significantly different ($P \leq 0.05$).

** Mean values ± SE within the row having different superscripts letters are not significantly different ($P \geq 0.05$).

A ≡ Sample with {66.6% Rice flour and 33.3% Maize (corn) flour}

B ≡ Sample with {33.33% Rice flour and 66.6% Maize (corn) flour}

C ≡ Sample with {50% Rice flour and 50% Maize (corn) flour}

Conclusions

The study concluded that Gluten free cake with Maize (corn) flours and rice flour had significantly affected ($P \leq 0.05$) on moisture, fat, protein, fiber, ash, pH value and minerals content. Inclusion of peanut and date pastes in cake formulations significantly improved the nutritional value of the cake products. Peanut and date pastes in cake formulations as expected had higher protein, fat, minerals content and overall acceptability than the control product. Finally study concluded that gluten free cake samples with 33.3% Maize (corn) flours and 66.6% rice flour was the best in appearance, flavour, texture and over all acceptability ($P \leq 0.05$) compared to other samples.

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