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FESTIVAL BAKERY PRODUCTS USING HEAT STABILIZED RICE BRAN

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ABSTRACT

In the present study, both of Kahk El-Eid and Petit-four were prepared from wheat flour with heat-stabilized rice bran (SRB) at 10, 20 and 30% replacement levels. Stabilized rice bran by heating represents good sources for nutrients such as fat, protein, fiber, minerals, vitamins and antioxidants. Most of nutrients were concentrated in fine fractions (lower than 400 μm). These fractions can be used to prepare Kahk El-Eid and Petit-four with nutritive advantage since Egyptians consume large amounts in their festival. Kahk El-Eid and Petit-four prepared from wheat flour with 10, 20 and 30% of heat-stabilized rice bran contained higher nutrients than the control. The sensory evaluation showed that it can replace wheat flour by heat-stabilized rice bran up to 10% without noticeable differences for Kahk El–Eid, and up to 20% with a little difference for Petit-four for their sensory characters. The specific volume values were decreased for Kahk El-Eid samples, and the hardness values increased with increasing the replacement levels of SRB. While, both parameters increased for Petit-four samples as replacement levels by SRB increased.

Key words: *festival bakery products, Kahk El-Eid, Petit-four, stabilized rice bran.*

1. INTRODUCTION

Festival bakery products with delicious flavor such as biscuits, cakes, pies, pastries, muffins, some kinds of bread and pizza are prepared in occasions all over the world. In Egypt, cookies called Kahk El-Eid and biscuits called Petit-four are prepared in Eid Al–Fitr (Festival of Breaking the Fast) after Ramadan fasting month where, Egyptians consume them in large amounts. Egyptians either bake them at home or buy it from the bakery. Therefore, there is a need to find the ingredients used in bakery products with beneficial nutritive to improve the nutritional quality of the baked products.

The main components of festival bakery products are flour, butter, sugar and egg. These bakery products are high in calories, fat and carbohydrates and poor in fiber and protein.

Rice bran is derived from the outer layer of the rice grain which is composed of an aleurone layer of the rice kernel with some proportion of the endosperm and germ, accounting for approximately 10% of the weight of the rice grain (Justo *et al.*, 2013 and Rondanelli *et al.*, 2011). Rice bran contains 25 to 30% fiber and its soluble fibers can affect blood cholesterol level when combined with biliary acid. The stabilized rice bran, unlike wheat bran as well as other fibers, has sweet and palatable taste (Bagheri and Seyedein, 2011). Different milling degrees of rice bran stabilized by extrusion process are very rich in phosphorus, potassium and contain suitable amounts of all essential and nonessential amino acids. The highest values of protein, ash, phenolic compounds and dietary fiber, high amounts of essential amino acids and all elements are present in the 1st fraction compared with those of other rice bran fractions (Abd El-Galeel and El-Bana, 2012). Rice bran is composed of lipophilic antioxidants (tocopherols, tocotrienols and γ-oryzanol) and phenolics (Min *et al.*, 2011). Moreover, rice bran is a very rich source of oils, wax, trace elements, antioxidants, phytosterols, and phytochemicals. It contains high energy (373 cal/1 cup or 118g), high protein, high fiber, with low sodium, and low sugar. It is a good source of manganese, magnesium, potassium, calcium, phosphorus, and vitamins (B1, B2, B6 and pantothenic acid). Rice bran in its crude or stabilized form is a potential dietary source which can be used as a nutritional supplement to prevent nutrient deficiencies in malnourished children (Rabbani and Ali, 2009). These substances provide

protection against chronic diseases of the cardiovascular system and help to quench the free radicals and anti-cancer effects (Abdul Hamid *et al.*, 2007 and Renuka and Arumughan, 2007). Rice bran inhibits the growth of human colon cancer cells. Some phenolic compounds have been reported to inhibit the growth of human breast and colon cancer cells (Verschoyle *et al.*, 2007.)

Some bakery products are good source of dietary fiber and may serve as low caloric diet. High fiber content in food products helps to overcome health problems such as high cholesterol, hypertension, diabetes, colon cancer and intestinal disorders (Pasha *et al.*, 2008). The addition of rice bran to wheat flour further increases the protein, lysine and dietary fiber contents in bread and cookies. The nutritional and functional properties of rice bran are suitable for baked products, namely cookies, muffins, breads, crackers, pastries and pancakes. Defatted rice bran can be used to substitute wheat flour up to 10-20% for making cookies without adversely affecting the quality (Sharif *et al.*, 2009).

Wheat flour cookies prepared from wheat, corn, rice and psyllium with addition of some fiber sources were sensory evaluated by Pasha *et al.* (2008). Cookies containing wheat bran (20%), corn bran (20%), rice bran (20%) or psyllium husk (10%) were highly accepted. Meanwhile wheat, soybean and rice bran flour blends were used for the formulation of protein-rich biscuits, and no significant difference was observed between the composite sample (wheat 70%, soybean 20% and rice bran 10%) and control in general preference of sensory ratings. Proximate compositions of the best-rated composite flour biscuit were protein (16.28 %), fiber (1.90%), fat (12.13%) and moisture (4.37%) (Bunde *et al.*, 2010). Biscuit supplemented with defatted rice bran (5, 10 and 15%) was considered more nutritive compared with control (wheat flour biscuit). It has higher contents of protein, ash and crude fiber. Furthermore, it has higher levels of phosphorus, potassium, zinc and manganese. The supplementation with defatted rice bran instead of wheat flour up to 10% was more suitable, while supplementation with 15% was just acceptable for the sensory evaluation of biscuits (Abd El-Galeel and El-Bana, 2012). Another study was conducted on wheat flour biscuits supplemented with both of soya and rice bran at 10 %, 15%, 20%, 25% levels of each to improve the quality of food products and functional properties. Sensory evaluation of prepared biscuit decreases with increasing the level of substitution. Overall acceptability score for biscuit with 15% soy flour+15% rice bran showed the highest rating compared to other treatments (Mishra and Chandra, 2012). In a case study on cake and pan bread prepared with stabilized rice bran at 10, 20 and 30% replacement levels, the results indicated that there was no significant difference observed for sensorial evaluated and control in cake replaced with up to 30%. While, pan bread with 20% replacement level had no significant differences in most characteristics except for texture and flavor (Abd El-kader and Hendawy, 2013).

This study aimed to use rich source of nutrients to prepare Kahk El-Eid and Petit-four for Egyptians Muslims.

2. MATEREIALS AND METHODS

2.1. MATERIALS

2.1.1. Rice variety (Sakha10) was obtained from Meet El Deba experimental farm of rice Mechanization Center (R.M.C) and dried to have moisture content of 14%, then milled.

Fresh rice bran stabilized in (R.M.C) in one pitch experimental heating unit immediately at 110°C for 20 min exposure time according to the method (Abd El-kader and Hendawy, 2013).

The obtained stabilized rice bran was packaged in polyethylene bags in (R.M.C) then kept to use in bakery products.

2.1.2. Flour for confectionary bakery products, Butter, milk, egg, yeast, powder sugar, salt and vanillin were obtained from local markets.

2.2. METHODS

2.2.1. Kahk El-Eid and petit-four prepared according to the methods described by Saba (2005). Both Kahk El-Eid and Petit-four were prepared from wheat flour (72% extraction rate) and stabilized rice bran (SRB) at replacement levels of 0, 10, 20 and 30% .

The formula of Kahk El-Eid and Petit-four are shown in Table (1).

2.2.2. Kahk El-Eid preparation

Scaled fat was added to wheat flour and stirred by wooden spoon until the mixture became warm. Yeast was dissolved in little warm water then mixed well with the previous mixture. Salt was dissolved in milk and then added to the obtained hard dough. The dough was divided to small parts, round and put in decoration pan to form the crust shape, then placed in greased baking tray, let to ferment and baked in preheated oven at 190°C for 20 min.

Table (1): The formula of Kahk El- Eid and Petit-four.

Ingredients, g	Petit-four	Kahk El -Eid
Wheat flour*	150	200
Butter	100	100
Egg	40	-
Yeast	-	5
Salt	-	0.2
Milk, ml	-	50
Powder Sugar	50	-
Vanillin	0.3	-
Sesame	-	20
Sodiumbicarbonate	-	2

*** Wheat flour (72%ext.rate) was replaced by SRB levels of 0,10, 20 and 30% for both products.**

2.2.3. Petit-four preparation

Fat was creamed at medium speed to light color, then powdered sugar was added gradually until fluffy appearance is formed. Eggs were added one after the other and finally vanillin. Wheat flour was added at three patches and mixed gently to form smooth dough. The dough was left for 20 min to rest, then formed to flower shape with machine. The Petit-four was baked in preheated oven at 180°C to reach golden color.

2.2.4. Rice bran preparation

Stabilized rice bran (SRB) was fractionated using sieving shaker model D-5657 Haan, Germany to obtain fractions of particle size higher than 500, 400, 355, 200 ,160 μm and lower than 160 μm. All the fractions with particle size below 400 μm were collected together and used for replacing wheat flour at different levels for preparing Kahk El-Eid and Petit-four.

2.2.5. Analytical methods

Moisture, crude protein, crude fiber, ether extract (fat), and ash contents of wheat flour and stabilized rice bran fractions were determined according to the methods described in A.O.A.C (2005). The total carbohydrate was calculated as the following equation.

carbohydrate% =100-[fat% + crudeprotein% + crwdefiber %+ ash content %]

Fractionated stabilized rice bran minerals (Mg, Na, Zn, Mn, Fe, Ca and K) were determined by using Atomic Absorption Spectrophotometer (Perkin Elmer Model 4100ZI) according to A.O.A.C (2007) No. 40-70, using the dry ashing method for samples preparation.

2.2.6. Measurement of volume and density

The most commonly encountered method for measuring product volume is using seed displacement. The volume of seed displaced is equal to the volume of the product. The more seed that is displaced the larger the product volume. After volume data are obtained, it is common practice to consider product density. This is simply described as the mass of the product divided by its volume, d =m/v. An alternative form of expressing such information is as specific volume (SV) which is simply the reciprocal of density, that is sample volume divided by sample mass, SV =v/m. Both density and SV terms are encountered in discussions of baked-product quality, the lower the product density, the higher its specific volume and vice versa (Cauvain and Young,2006).

2.2.7. Sensory evaluation of the products

The obtained Kahk El-Eid and Petit-four products were sensory evaluated according to the method described by Bunde *et al.*(2010). Some parameters were added to the method to cover the sensory characteristics of Kahk El-Eid and Petit-four. The evaluated parameters were general appearance, crust color, crumb color, softening, mouth feel, crispness, odor and taste. The score sheet is presented in Table (2).

Table (2): Score sheet for sensory evaluation of Kahk El-Eid and Petit-four.

Properties	Kahk El- Eid	Petit-four
General appearance	10	20
Crust color	10	20
Crumb color	10	-
Softening	15	10
Mouthfeel	15	-
crispness	-	10
Odor	20	20
Taste	20	20

2.2.8. Hardness

Hardness was the maximum load, expressed in kg, applied to the samples during the first compression. Hardness was the force required to bite completely through the sample when placed between molars, (Meulleneti *et al.*,1998).

2.2.9. Statistical analysis

The obtained data were exposed to analysis of variance. Duncan's multiple range tests at $P \leq 0.05$ level was used to compare between means. The analysis was carried out using the PRO ANOVA procedure of Statistical Analysis System (SAS, 1996).

3. RESULTS AND DISCUSSION

3.1. Rice bran fractionation

Table (3) illustrates the percentages of ractions of stabilized rice bran. The percentage

accumulated under sieves 400 µm was 66.48%. The high fraction percentage of stabilized rice bran (33.38%) was found above sieve of 200 µm. Quilez *et al.* (2013) mentioned that particles size of rice bran extruded and steam stabilized were 31.7 and 20.9% in size of 0.5mm, 51.7 and 65.6% in size of 0.5 to 0.3 mm, 12.5 and 9.7% in size of 0.3-0.25 mm, 3.7 to 3.6% in size of 0.25 to 0.20 mm and 0.4 to 0.2% in size of 0.2 to 0.125 mm.

Table (3): Sieving shaker percentages of stabilized rice bran.

Diameter of holes	Weight(g)	%
500 µm	150.78	25.13
400µm	50.34	8.39
355µm	68.82	11.47
200µm	200.28	33.38
160µm	129.78	21.63
>160µm	trace	-

3.2. Chemical composition of wheat flour 72%, whole stabilized rice bran and its fractions (on dry weight basis)

The chemical composition of wheat flour and stabilized rice bran fractions are presented in Table (4). The chemical analysis showed that the stabilized rice bran contained high protein, fat, ash and fiber than wheat flour. Arafa *et al.* (2014) showed that the chemical components of wheat flour and stabilized defatted rice bran were protein (11.15, 13.83), ether extract (1.38,1.41), ash (0.56,8.64) and fiber (0.71, 8.36).

The data of stabilized rice bran showed that the fraction of 400 µm had high protein content, while high fiber was found in the fraction of 355 µm and high ash was found in the fraction of 200 µm. On the other hand, the coarse sieving fraction of 500 µm was higher in fat and lower in fiber content. The fine fractions (355 and 400µm) were high in fiber and protein content, respectively, compared to whole rice bran. The chemical constituents of rice bran accumulated under sieve 400 were fat 19.92%, protein 11.48%, ash 8.08% and fiber content 5.67 %. Numerous studies conducted on rice bran showed that moisture, crude protein, and crude fat were found to be 18 , 18.17 %, 12.60, 13.25% and 16.67, 16.93 %, for acid stabilized rice bran and heat-stabilized rice bran respectively, (Younas *et al.*, 2011). Esa *et al.* (2013) mentioned that, the protein, fat, fiber and ash contents in rice bran ranged between 10.6 to 16.9%, 5.1 to 19.7%, 7.0 to 18.9% and 8.8 to 28.8%, respectively.

3.3. Mineral content of wheat flour, whole stabilized rice bran and its fractions

Results in Table (5) indicated that rice bran was a good source for minerals. The data showed that Mg, Zn, Mn, Fe, Ca, and K contents in stabilized rice bran were higher than those in wheat flour. Fraction of 500 µm had higher content in Zn (17.02mg/100g). Meanwhile, fraction of 355µm had higher content of Na (354.67mg/100g) and Mn (58.82 mg/100g). High values of Ca, K and Mg were found in fraction of 160 µm, being 8.84 mg/100 g, 3.18 % and 1.59%, respectively. Iron content was recorded to be 51.3 mg/100g in fraction of 200 µm. Moderate values were detected in Zn, Mn, Fe and K in rice bran accumulated under sieve 400 µm, but these values were higher than those

Table (4): Chemical composition of wheat flour 72%, whole stabilized rice bran and its fractions (as dry weight basis).

Samples	Moisture %	Fat %	Protein %	Ash %	Fiber %	Carbohyd-rates, %
Wheat flour 72%	12.76	1.55	11.71	0.64	0.49	85.61
Whole meal R.B	7.98	19.87	13.34	7.55	5.28	53.96
Rice bran fractions						
500µm	7.86	21.15	13.96	6.97	2.71	55.21
400µm	7.07	20.76	15.84	6. 69	5.75	50.96
355µm	7.34	20.85	11.72	8.03	8.91	50.49
200µm	7.11	20.51	11.38	8.24	5.75	54.12
160µm	7.48	18.56	11.51	7.84	3.80	58.29
Under seive400µm		19.92	11.48	8.08	5.67	54.85

Table (5): Mineral content in wheat flour, whole stabilized rice bran and its fractions.

Samples	Mg %	Na mg/100g	Zn mg/100g	Mn mg/100g	Fe mg/100g	Ca mg/100g	K %
Wheat flour 72%	0.06	119.17	1.89	0.45	5.20	1.9	0.23
whole meal R.B	1.15	116.19	14.42	17.20	32.33	3.64	0.68
Rice bran fractions							
500µm	1.41	117.83	17.02	20.24	35.76	3.46	1.16
400µm	1.18	124.79	12.99	18.85	31.27	3.82	1.25
355µm	1.19	354.67	12.38	58.82	34.98	6.28	0.93
200µm	1.26	109.63	16.34	21.20	51.30	4.06	1.16
160µm Under sieve	1.59	114.27	16.13	24.45	34.46	8.84	3.14
400µm	1.36	153.09	15.59	28.75	43.00	6.03	1.76

determined in wheat flour. Younas *et al.*(2011) mentioned that heat stabilized rice bran contained 63.24 ppm Fe, 16.53 ppm Mn, 24.44 ppm Zn, 294.88 ppm Ca and 270 ppm Mg. The results reported by Rosniyana *et al.* (2007) showed that minerals contents in rice bran at 4% milling degree stabilized by autoclaving, were Fe 14, K 1170, Ca 54, Mg 823 and Na 24 mg/100g.

3.4. The chemical composition of kahk El-Eid and Petit-four prepared from wheat flour with SRB at different replacement levels

The chemical composition of kahk El-Eid and Petit-four prepared from wheat flour replaced by SRB at levels of 0,10,20, and 30% are presented in Tables 6 and 7.

3.4.1.Chemical composition of kahk El-Eid prepared from wheat flour and stabilized rice bran at different replacement levels

Table (6) reveal that a gradual increase in protein, fat, ash and fiber content was observed with increasing the replacement levels by rice bran.

Fat was the highest component content of 29.13% in control, while ranged between 30.01 and 31.88% in Kahk El-Eid prepared with stabilized rice bran; the percent of increase was 9.44% between control and 30% replacement. There was a noticeable increase in fiber content in Kahk- El-Eid samples as replacement levels by SRB increased. The percentage of fiber increment was 191.49% in the higher replacement level (30%). The ash content was 1.05% in control and percentage of increase was 105.71% in 30% replacement level by stabilized rice bran compared with control. There is no visible increase in protein content in Kahk- El Eid prepared with stabilized rice bran compared to control. In regards with minerals content in 100 g of Kahk El-Eid samples prepared with replacement level 30% by stabilized rice bran, Zn Fe , Mn and K contents were found to cover 30 , 50.83, 216.5and 8.49% of daily requirement for adults (RDI, 2011).

3.4.2.Chemical composition of petit- four prepared from wheat flour with replacement by SRB at different levels

Table (7) demonstrate a clear increase in fat, ash and fiber content in petit- four samples compared with control. There is a little increase in protein content of petit-four samples prepared with 10, 20 and 30% stabilized rice bran which was 3.48% in high replacement percentage. The increment of fat, ash and fiber was 8.80, 173.08 and 400 %, for 10, 20 and 30% SRB replacement levels respectively. The minerals content in petit-four prepared from wheat flour with stabilized rice bran increase by increasing of the replacement of rice bran. Obvious increases were observed in Zn, Mn and Fe content in Petit-four samples containing SRB than control. One hundred gram of Petit four prepared with 30% stabilized rice bran contain Zn cover 29.73 %, Mn cover 183.04, Fe cover 40.50% and K cover 7.84 of daily requirement for adults.

From the data presented in Tables (6 and 7) it can be concluded that there is a regular increase in chemical composition of Kahk El-Eid and petit-four samples prepared from wheat flour replaced by 10, 20 and 30% stabilized rice bran compared to control one. The increase in fat content was higher in Kahk El-Eid (9.44 %) than in petit-four samples (8.80%), while the increase was lower in ash (105.71 and 173.08%), fiber (191.49 and 400.0%) and protein content (1.47 and 3.48%) for Kahk El-Eid and petit four samples, respectively. The mineral content in 100g of Kahk El-Eid and petit-four cover the

Table (6): Chemical composition of kahk El-Eid prepared from wheat flour and stabilized rice bran at different replacement levels.(on dry weight basis).

Component	Control (%)	10% SRB (%)	20% SRB (%)	30% SRB (%)	RDI, 2011 (adults)
Protein	9.51	9.39	9.56	9.65	56 g/d
Fat	29.13	30.01	31.05	31.88	ND
Ash	1.05	1.42	1.70	2.16	-
Fiber	0.47	0.78	1.02	1.37	38 g/d
Carbohydrate	59.84	58.40	56.67	54.94	130 g/d
Minerals(mg/100g)					
Mg	17.36	112.83	179.49	246.16	420 mg/d
Na	74.77	77.79	80.82	83.84	1.5 g/d
Zn	1.29	1.96	2.63	3.30	11 mg/d
Mn	0.24	1.86	3.48	4.98	2.3 mg/d
Fe	3.89	5.65	7.50	9.15	18 mg/d
Ca	78.58	78.78	78.98	78.19	1.3 mg/d
K	66.98	253.11	323.51	399.25	4.7 g/d

Table (7): Chemical composition of petit-four prepared from wheat flour with stabilized rice bran at 10, 20 and 30%, replacement levels.

Component	Control (%)	10% SRB (%)	20% SRB (%)	30% SRB (%)	RDI (adults)
Protein	6.60	6.68	6.76	6.83	56 g/d
Fat	26.81	26.04	28.38	29.17	ND
Ash	0.52	0.83	1.11	1.42	-
Fiber	0.19	0.44	0.69	0.95	38 g/d
Carbohydrate	65.88	66.01	63.06	61.63	130 g/d
Minerals (mg/100g)					
Mg	6.29	86.93	143.23	199.54	420 mg/d
Na	86.07	88.62	91.71	93.73	1.5 g/d
Zn	1.57	2.14	2.70	3.27	11 mg/d
Mn	0.20	1.57	2.94	4.21	2.3 mg/d
Fe	2.86	4.34	5.91	7.29	18 mg/d
Ca	16.49	16.66	16.83	17.01	1.3 mg/d
K	49.14	206.35	268.81	368.56	4.7 g/d

daily requirement for adults in Mn, and Ca.Microwave stabilized defatted rice bran was added to wheat flour at replacement levels of 10, 20, 30, 40 and 50% to prepare fiber and mineral enriched cookies and to improve dietary fiber content and mineral profile of the cookies (Sharif *et al.*, 2009).

3.4.3. Sensory evaluation of Kahk El-Eid prepared from wheat flour replaced by Stabilized rice bran at different levels

Sensory evaluation values of Kahk El-Eid prepared from wheat flour replaced by stabilized rice bran are presented in Table (8). The obtained results indicated that samples of Kahk El-Eid contained10% SRB were significantly different from control for general appearances, crust color, crumb color and mouth feel, while softening, taste and odor were found to be not significantly different from control. Concerning 20% SRB level, the samples were significantly different from control for all the evaluated characteristics except odor. At 30% SRB replacement level, all the evaluated characteristics of the samples were significantly different from control. The obtained data agreed with Younas *et al.* (2011) who mentioned that addition of heat-stabilized rice bran to wheat flour cookies got the highest scores for color,

Table(8): Sensory evaluation of Kahk-El Eid prepared from wheat flour with stabilized rice bran at 10,20 and 30%, replacement levels.

Samples	General appearance (10)	Crust color (10)	Crumb color (10)	Softening (15)	Mouth feel (15)	Taste (20)	Odor (20)
Control	9.8 a ±0.4	9.8 a ±0.4	9.8 a ±0.4	14.7 a ±0.4	14.7 a ±0.4	19.7 a ±0.6	19.8 a ±0.4
10%SRB	9.0 b ±0.4	9.0 b ±0.4	8.9 b ±0.5	13.7 a ±0.8	13.6 b ±0.8	18.2 ab ±1.6	19.3 a ±0.8
20%SRB	8.3 c ±0.6	8.3 c ±0.4	7.7 c ±1.6	12.2 b ±1.6	12.8b ±0.9	16.9 b ±1.9	18.5ab ±1.5
30%SRB	7.1 d ±0.7	7.1 d ±0.7	6.9 d ±0.9	10.9 b ±2.1	11.5 c ±1.6	15.0 c ±2.6	17.1 b ±2.7

*Data are presented as means ±SD(*n=10*)In a column, means having the same letters are not significantly different at 5 % level.

taste, flavor, texture and overall acceptability and the color of cookies decreased significantly with the increase in the level of rice bran. Sudha *et al.*(2007) reported that progressive increase in supplementation level of rice bran produced progressively darker cookies. Sharma and Chauhan (2002) reported that flavor response decreased with the increase in the level of bran in the cookies up to 20 percent replacement of flour by wheat bran. Defatted rice bran can be used up to 10 - 20% replacement levels in wheat flour to prepare rice bran supplemented cookies without adversely affecting quality attributes (Sharif *et al.*, 2009).

3.4.4. Sensory evaluation of Petit-four prepared from wheat flour replaced by Stabilized rice bran at different levels

From the results in Table (9) it can be noticed that sensory evaluation values of Petit-four samples contained 10% SRB were not significantly different from control for all parameters. While, Petit-four samples containing 20% SRB level were found to be significantly different in all parameters (general appearance, color, crispness, softness and taste) except for odor. Concerning Petit-four samples of 30% SRB replacement level, all parameters were significantly different from control. Sudha *et al.* (2007) mentioned that rice bran incorporation in biscuit ingredients increased the darkness and reduced the surface smoothness. Above 30% incorporation of rice bran in the biscuits resulted in dark crumb color and very hard texture. Taste of the biscuits was affected at 20% level. The mouth feel became dry. In a study by Quilez *et al.* (2013) the sensory evaluation values of bread were found to decrease with increasing the level of rice bran from 3 to 9% in bread. In the same time the bread with 9% rice bran having off flavor pointed in the sensory evaluation.

3.4.5. Specific weight and specific volume of Kahk El-Eid and Petit four prepared from wheat flour replaced by stabilized rice bran at different levels

Specific volume and specific weight values for both of Kahk El-Eid and petit -four prepared from wheat flour replaced by SRB at three levels (10, 20 and 30%) are presented in Table (10). The results indicated that specific volume of Kahk El-Eid slightly decreased with increasing the rice bran replacement levels, while specific volume of Petit-four samples increased. These results mean that the proportion of volume to weight decreased as a result of the increase of weight of kahk El-Eid. The increase of specific weight in petit- four may be related to the decrease of the weight proportion to volume. Majzoobi *et al.* (2013) mentioned that using a higher quantity of bran (20%) with larger particle sizes (210 mm) increased cake density and weight of the cakes while decreased the cake volume.

Table (9): Sensory evaluation of Petit-four prepared from wheat flour with stabilized rice bran at 10, 20 and 30%, replacement levels.

Samples	General appearance (20)	Color (20)	Crispness (10)	Softness (10)	Odor (20)	Taste (20)
Control	18.5 a ±0.9	18.7 a ±0.6	8.3 a ±0.9	8.8 a ±0.6	18.8 a ±0.7	18.8 a ±0.6
10%SRB	17.8 ab ±0.6	18.1 ab ±1.1	8.1ab ±0.6	8.2 a ±0.6	18.6 a ±0.9	18.5 ab ±1.6
20%SRB	17.1 b ±1.6	17.2 b ±1.6	7.4 b ±0.8	7.2 b ±0.4	18.2 a ±1.3	17.3 bc ±1.3
30%SRB	15.3 c ±1.4	15.0 c ±2.1	6.4 c ±0.8	6.2 c ±0.9	16.5 b ±2.9	16.2 c ±2.0

*Data are presented as means ±SD(*n=10*). In a column, means having the same letters are not significantly different at 5 % level.

Table (10): Specific weight and specific volume of Kahk El-Eid and Petit-four prepared from wheat flour with stabilized rice bran at 10, 20 and 30%, replacement levels.

Samples	Specific volume cm^3/g	Specific weight g/cm^3	Specific volume cm^3/g	Specific weight g/cm^3
	Kahk El-Eid		Petit-four	
Control	1.83	0.66	1.21	0.83
10% SRB	1.75	0.63	1.22	0.82
20% SRB	1.70	0.61	1.38	0.73
30% SRB	1.66	0.60	1.69	0.59

SRB= Stabilized rice bran

3.4.6. Hardness (N) of Kahk El-Eid and Petit-four prepared from wheat flour replaced by stabilized rice bran at different levels

The hardness values of Kahk El-Eid and Petit-four are presented in Table (11). The data revealed that hardness (N) of Kahk El-Eid increased by increasing the replacement levels of stabilized rice bran. The highest increase was found in Kahk El-Eid with 20% replacement level of stabilized rice bran compared with 10% and the increase in hardness was 9.7 N. Meanwhile, the increment was 2.45 N and 14.62 N for 10% and 30% replacement levels by stabilized rice bran compared with control samples. In regards with Petit-four, the hardness increased gradually by increasing the replacement levels of stabilized rice bran. These results were in agreement with Sudha *et al.* (2007) who mentioned that biscuits became harder as seen in the increasing breaking strength values especially at 30% and 40% levels of rice bran and were as high as 2.38 and 3.8 kg, respectively. Majzoobi *et al.* (2013) reported that textural properties of the samples as determined instrumentally showed that maximum compressive force and the firmness increased, with increasing the contents of bran and its particle size.

Table (11): Hardness (N) of Kahk El-Eid and Petit-four prepared from wheat flour with stabilized rice bran at 10, 20 and 30%, replacement levels.

Samples	Kahk El-Eid	Petit-four
Control	1.57	1.51
10% SRB	4.02	5.05
20% SRB	13.72	7.11
30% SRB	16.19	12.11

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مخبوزات الاعياد باستخدام رجيع الارز المثبت حراريا

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ملخص

تم فى هذه الدراسة اعداد كحك العيد والبيتى-فور باستبدال دقيق القمح برجيع الارز المثبت حراريا بنسب 10 و20 و30%. يعتبر رجيع الارز (المثبت حراريا) مصدرا جيدا للبروتين والالياف الغذائية والزيت والاملاح المعدنية والفيتامينات ومضادات الاكسدة. يتركز معظم هذه المغذيات فى الاجزاء الناعمة (اقل من 400 مللى ميكرون).هذه الاجزاء يمكن ان تستخدم فى اعداد كحك العيد وبيتى فور مميز غذائيا حيث يأكل المصريون كميات كبيرة منه فى احتفالاتهم. يصبح كحك العيد والبيتى فور المصنع باستبدال 10و20 و30% من دقيق القمح برجيع الارز المثبت حراريا اعلى فى محتواه من المغذيات بالمقارنة بالمعاملة القياسية. اظهرت نتائج التقييم الحسى انه يمكن استبدال دقيق القمح برجيع الارز المثبت حراريا حتى نسبة 10% فى كحك العيد بدون اى فروق ملحوظة ، وحدوث تغيرات طفيفة فى الصفات الحسية حتى نسبة 20% للبتى فور. تتناقص قيم الحجم النوعى لكحك العيد فى حين ان قيم الصلابة تزداد بزيادة معدل استبدال رجيع الارز المثبت حراريا. بينما زادت قيم الحجم النوعى والصلابة فى البيتى فور .

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