اعداد بعض المخبوزات منخفضة السعرات

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الملخص

تهدف من هذه الدراسة هو إنتاج (كوكيز، كيك، وخبز القوالب) منخفض السعرات. حيث تم الاستبدال الكلي لدقيق القمح (استخراج ٧٢%) بدقيق الشوفان الكامل ، وايضا استبدال كلي للدهون بصلصة التفاح لاعداد الكوكيز. كذلك تم اعداد نوعين من الكيك . النوع الاول به استبدال كلي لدقيق القمح ٧٢% بدقيق الارز الاسود ، والنوع الثاني استبدل فيه دقيق القمح ٧٢% كليا بدقيق الشوفان الكامل ، وفي كلا النوعين تم الاستبدال الكلي للبيض بالخل.ايضا تم اعداد خبز القوالب بالاستبدال الكلي لدقيق القمح ٧٢% بنخالة القمح ودقيق القمح استخراج ٨٢% وكانت نسبة النخالة : لدقيق القمح استخراج ٨٢% (١:٢) . وتم تحديد التركيب الكيميائي للمواد الخام المستعملة (دقيق القمح ٧٢%، ودقيق القمح ٨٢%، ودقيق الشوفان الكامل، ودقيق الارز الاسود)، وكذلك المخبوزات ايضا، وكذلك تم اجراء التقييم الحسي للمخبوزات. وتم تحديد محتوي السعرات الحرارية للمخبوزات. اظهرت نتائج الدراسة ان ١٠٠ جم من كوكيز الشوفان وصلصة التفاح اقل في محتواه من السعرات الحرارية عن الكوكيز المعد بالمكونات التقليدية. ووجدت فروق معنوية بين الكيك المعد بالمكونات التقليدية وكل من كيك الارز الاسود وكيك الشوفان ، حيث كان كيك الشوفان اقلهم في محتواه من السعرات الحرارية (٢٤٤ سعر/١٠٠ جم) ويليه كيك الارز الاسود (٢٧٢،٥سعر/١٠٠ جم). وعند مقارنة خبز القوالب المعد بمكوناته التقليدية بخبز القوالب المعد من نخالة القمح ودقيق القمح استخراج ٨٢% وجد فرق معنوي ($P < 0.01$) بينهم في محتوي السعرات الحرارية (١٨٤،٤ سعر/١٠٠ جم) لخبز النخالة بينما كان خبز دقيق القمح يحتوي

(٢٥٠،٣ سعر/١٠٠جم).

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Preparation of some low-caloric bakery products

Abstract: Aim of this study was to produce low caloric (cookies, cakes, and molds bread). Totally substitution of wheat flour 72% by whole oats flour while fat was totally substituted by apple sauce to prepare cookies. Two types of cakes were prepared. First type was the totally replacement of wheat flour with black rice flour. Second type was the total replacement of wheat flour with whole oats flour. In both types, eggs were replaced with vinegar. Wheat flour was totally substituted by 75 % wheat bran and 25% wheat flour 82% to prepare molds bread. Chemical composition for raw materials were determined. Sensory evaluation for bakery products was conducted, then the chemical composition and caloric calculation for bakery products were determined. The obtained results showed that cookies of oats and apple sauce had the lower energy than control per 100 g. So, the difference between them was significant. Caloric values of two types of cakes had significant difference ($p < 0.05$) compared to control. Oats cake was the least calorie content (244 Cal\100 g) followed by the black rice cake (272.5 Cal\100 g). Molds bread with 75% wheat bran and 25% wheat flour 82% contained (184.4 Cal\100 g) compared to the control contained (250.3Cal\100 g) is shown high significant difference in caloric value ($P < 0.01$).

Key words: low calorie – black rice flour – oats flour – wheat flour 82%– wheat bran – apple sauce.

1. Introduction

Nutrition related diseases are increasing because, among other reasons, energy intake is too high and dietary fiber intake is below recommendations. This result in a duplication of the population with overweight and obesity in the last 30 years (**WHO. 2014**). Obesity may be related to other diseases (**Grundy, 2004**). Weight management and get rid of obesity based on reducing the intake of calories than the consuming (low calorie diets).

Low-calorie diets defined as a balanced ratio of protein, carbohydrate, and fat in reduced quantities to provide an energy intake of 800 to 1500 kcal per day. This can be achieved through consumption foods as essential sources for the fiber needed for healthier diets (**Krauss, et al., 2000**). Whole grains, fruits and vegetables are a major source of fiber.

Wheat bran (WB) is a by-product of wheat milling (**Curti et al., 2013**). WB is composed of about 53% dietary fibre. (**Brewer et al., 2014**). WB is rich in minerals, fibre, B vitamins and bioactive compounds which are known to possess health-promoting properties (**Reisinger et al., 2013**).

Black rice is a type of the rice species (Oryza sativa L). This rice is free of gluten, free of cholesterol, low in sugar, salt and fat. Black rice is high in fiber, anthocyanin, antioxidants, phenolic acids, flavonoids, vitamins B and E, iron, copper, thiamine, magnesium, niacin and phosphorous, It also contains

18 amino acids and carotene (**shanghai linget et al.,2002**). The use of food products from black rice gave up germs that help to prevent headaches, relieve symptoms of constipation, prevent colon cancer, adjust blood sugar levels, prevent heart disease, lower blood pressure and prevent Alzheimer's disease (**Defa and Meizu 2006**).

Oats (Avena sativa L.) are one of the most nutritious grain cereals (**Ahmad and Zaffa, 2014**). **Brennan and Cleary (2005)** stated that oat had long been recognized as a natural ingredient of functional foods because they provide dietary fiber, good protein, unsaturated lipids, vitamins, minerals components and antioxidants required for human health. Oats contain many essential amino acids necessary for human body (**Biel et al., 2009**), and high antioxidant activity components (**Koenig et al., 2014**). Oat had been reported to be effective in moderating the effects of hypertension, lowering the total serum- and LDL-cholesterol, regulating blood glucose and insulin levels, controlling weight and promoting gastrointestinal health. Many of these effects were attributed to the presence of dietary fibers, principally the β-glucans (**Lambo et al., 2005**).

Applesauce is considered the best substitute for fat in fat based baked goods. Apples are not only high in pectin, but also in nutrients and phytochemicals. Apples have many health benefits including: anticancer, antidiabetes and prevention of heart diseases (**Gerhauser, 2008**). Apple polyphenols can also regulate fat metabolism and lower the level of LDL cholesterol (**Jensen et al., 2009**).

Bakery products such as cookies, cakes and molds bread are enjoyed by diverse people, both young and old, residing in rural and urban areas (**Amani and Amal, 2017**). Changes in consumer trends are occurring there have been increasing demands for healthier bakery products that are low in calories, fat and sugar in general and contain health promoting components, such as fiber and unsaturated fatty acids (**oyeyinka et al., 2014**).

Therefore, the aim of this study was to produce low caloric (cookies, cakes, and molds bread). By totally substitution of wheat flour 72% by oats flour while fat was totally substituted by applesauce to prepare dough of cookies. Two types of low caloric cakes were prepared. The first type was the total replacement of wheat flour with black rice flour. The second type was the total replacement of wheat flour with oats flour. In both types, eggs were replaced with vinegar. As well wheat flour was totally substituted by both wheat bran and wheat flour 82% to prepare batter of molds bread making. The ratio between wheat bran and wheat flour was (2: 1).Chemical composition for wheat flour (72%, 82% extraction), black rice, oats flour, wheat bran and their products were determined. Then calories were calculated and sensory evaluation of substituted cakes, cookies and bread were performed.

2. Material and Methods

2.1 Materials:-

Black rice, Oats were purchased from Agricultural Research Center, Giza, Egypt. Other components included wheat flour 82% extraction, wheat bran, sunflower oil sodium bicarbonate, baking powder, brown sugar, and white vinegar were purchased from local market in Assiut city, Egypt. The samples were obtained in 2017. The previous materials were use to preparation some low-calorie bakery products. These products were cakes, cookies and toast bread.

2.2 Methods:-

2.2.1 Preparation of (black rice and oats) flour:

The Black rice and oats were cleared from foreign objects and dirt. They were milled into flour. The flours were screened through a 0.25 mm sieve several times to obtain the whole flour. Then stored at 4 °C in a refrigerator to prevent spoilage specially rancidity until the usage. The process ensures effective removal of most anti nutritional factors.

2.2.2 Preparation of applesauce:

240 g of peeled apples were used with 250 ml of water, 5 g of cinnamon, 5 g of brown sugar and raised on medium fire for 1 hour. Then leave half an hour cooled and packed in glass jar to keep in the refrigerator.

2.2.3 Chemical analysis of flour:

Moisture, protein, fat, fiber and ash contents for (black rice, oats) flour, wheat flour 72%, wheat flour 82% and wheat bran were determined according to **AOAC (2010)** in Agricultural Research. Center, Cairo University. The analyses were performed from an average of three times.

Carbohydrate content was calculated by difference.

Carbohydrates % = 100 – (moisture % + protein % +fat % +ash %) according to the methods of the (**AOAC, 2010**).

2.2.4 Preparation of cookies:

Cookies were prepared by the method reported by **Abayomi et al.** (2013) with modification. Total wheat flour was replaced with whole oats flour, and total replacement of margarine and egg with applesauce. Sugar was creamed with applesauce until light constituency was obtained using electric egg racket. Whole oats flour was added, followed by skimmed powder milk, baking powder and salt were added and mixed until batter was obtained. The batter was cut into circular shapes with a hand, arranged on a greased tray and baked at 150°C for 20 min. The cookies were cooked, brought out and packaged in plastic bag until used for sensory evaluation and laboratory analysis. All Ingredients of cookies have been detailed in Table (1).

Table1. Formulations of oats and applesauce cookies

Ingredients	**Control(g)**	**A* cookies (g)**
Wheat flour	200	0
Whole Oat flour	0	200
Margarine	100	0
Applesauce	0	100
White sugar	90	0
Brown sugar	0	57
Eggs	60	0
Water(ml)	25	100
Vanilla	3	0
Cinnamon	0	3
Baking powder	0.1	0
Sodium bicarbonate	0	8
powdered milk	20	0
skimmed powder milk	0	3
Salt	1	1

A*: cookies

2.2.5 Preparation of (black rice and oats) cakes:

Cakes were prepared according to the method reported by (**Erica et al., 2010**) modification. The first cake was the total replacement of wheat flour with black rice flour. While the second cake was the total replacement of wheat flour with oats flour. In both cakes, eggs were replaced with vinegar. A single-bowl mixing procedure was used for making cakes. To preparation of both cakes (B, C), white sugar was replaced with brown sugar, while eggs were replaced with white vinegar but milk was replaced with water, these ingredients have been detailed in Table (2). All ingredients were mixed during 10 min using hand racket. The batter was placed into aluminum pans, previously oiled and sprinkled with wheat flour, and baked in a conventional oven pre-heated to 180 °C for 30 minutes. After cooling, the cakes were weighed and sliced to calculate the total cake yield and servings. Sensory evaluation of these cakes is performed. The samples were taken, wrapped in plastic bags, and kept in a freezer at –20 °C for further chemical analysis.

Table.2. Formulations of black rice and oats cakes

Ingredients	**Control(g)**	**B*cake (g)**	**C**cake(g)**
Wheat flour	285	0	0
Black rice flour	0	285	0
Oat flour	0	0	285
Oil	60	45	45
White sugar	145	0	0
Brown sugar	0	145	145
Eggs(whole, fresh)	150	0	0
White vinegar	0	10	10
Water(ml)	60	188	285
Vanilla	3	3	3
Baking powder	30	0	0
Sodium bicarbonate	0	7	7

***B**: Black Rice cake **C**: Oats cake

2.2.6 Preparation of molds bread:

The preparation of molds bread was according to the method of **chauhan et al.,(1992)** with a modification where it has been total substitution of wheat flour 72% extraction by wheat bran and wheat flour 82% extraction. The ratio between wheat bran and wheat flour was (2: 1). Molds bread was prepared by mixing all ingredients. The dough was fermented for 90 minute and baked at 260^0 c, for 30 minute. Molds bread was cooled at room temperature for two hours and cut with a knife into 1.5 cm slices. Sensory evaluation of Molds bread is performed. then stored in plastic bags. Table (3) showed ingredients of molds bread.

Table 3.Formulations of wheat bran and wheat flour 82% extraction molds bread.

Ingredients	**Control (g)**	**D* (g)**
wheat flour 72%	495	0
wheat flour 82%	0	165
Wheat bran	0	330
Bakers yeast	9	9
Salt	5	5
Sugar	13	13
sunflower flower oil	10	10
Water	280 ml	280 ml

D*: molds bread

2.2.7 Yield factor:

The bakery products yield factor was calculated from the ratio cooked/uncooked batter and the results expressed in number of servings of 80 g each.

2.2.8 Chemical composition of dried cakes, cookies and molds bread:

Moisture, protein, fat, fiber and ash contents for products (cakes, cookies and molds bread) were determined according to **AOAC (2010)** in Agricultural

Research. Center, Cairo University. The analyses were performed from an average of three times. Carbohydrate content was calculated by difference.

Carbohydrates% 0n wet weight = 100 − (moisture% + protein% + fat% + ash% + fiber %).

Carbohydrates% 0n dry weight = 100 − (protein% + fat% + ash% + fiber %).

2.2.9 Caloric value of Cakes, cookies and molds bread:

Calories were calculated based on wet weight by the formula of (**Pinki and Pratima., 2014**) as follows:

Total calories = Fat × 9 + Protein × 4 + Total carbohydrate × 4

Equation used to convert dry weight to wet weight to calculate calories on wet weight.

$$\text{Wet weight} = \frac{\text{Dry weight } (100 - \text{Moisture ratio})}{100}$$

2.2.10 Sensory evaluation of Cakes, cookies and molds bread:

Study products were evaluated in terms of color, taste, flavour, texture, appearance, crispiness, (crust and crumb) color, irregular shape, crumb hardness and the overall acceptability after 6 hrs upon cooling at room temperature. These points were evaluated by 50 persons (specialists of nutrition and food science and ordinary people) by hedonic scale ranging from 1 to 10 (1 is very bad and 10 for excellent) (**A.A.C.C. 1996**).The products were placed in white dishes under strong white lighting during evaluation. Water was provided to rinse the palate between two tasting sessions.

2.2.11 Statistical analysis:

Data were presented as the mean of duplicate± standard deviation (mean ± SD). Randomized complete block design was used with five replications each one contains 10 persons for each product. Analysis of variance (ANOVA) was carried out using Proc Mixed of SAS package version 9.2 (SAS 2008)

and means were compared by Duncan test at 5% level of significant (**Steel &Torrie, 1981**).

3. Results and Discussion

3.1. Chemical analysis of raw materials:

Data presented in Table (4), showed the chemical analysis of raw materials used in preparation of low-caloric bakery products. Whole oats was the least in carbohydrates content and moisture compared with wheat flour 72%, , as was the highest content in the fiber, ash, fat this result agreed with (**Mahsa et al.,2015**).

Wheat bran was the highest in moisture and protein and also contained a high percentage of fiber.

Carbohydrate was (82.95%) the highest in wheat flour 72% comparing with the other samples and (10.56 %, 4.08%, 3.50 %, 5.97 % and 3.50%) in moisture, protein, fiber, ash and fat respectively this result agreed with (**Gomes et al., 2016**).

The chemical analysis of wheat flour 82% extraction rate was (12.77%, 11.23 %, 6.76%, 0.97% and 1.78 %) in moisture, protein, fiber, ash and fat, respectively this result agreed with (**Attia et al., 2007**).

While the chemical analysis of black rice flour was (10.61%, 4.75 %, 3.49%, 12.65% and 2.24%) in moisture, protein, fiber, ash and fat respectively.

Table4.chemical composition of wheat flour 72%, wheat flour 82%, wheat bran, black rice flour and oats flour (g/100g) on (dry basis).

Samples	Values in %					
	Moisture	Protein	fiber	Ash	Fat	Carbohydrates
Wheat flour 72%	10.56	4.08	3.50	5.97	3.50	82.95
Wheat flour 82%	12.77	11.23	6.76	0.97	1.78	79.26
Wheat bran	15.65	20.25	7.07	3.5	4.2	64.98
Black rice	10.61	4.75	3.49	12.65	2.24	76.87
Oats	5.06	10.58	8.66	42.92	6.67	31.17

3.2 Study products yield:

Table(5) showed that (cookies yield 5.1, black rice cake yield 7.5, whole oats cake yield 8.7 and Molds bread yield 7.8) servings of 80 g each, and the highest yield was provided by whole oats cake and Molds bread

Table5. Yield of studied products

description	Formulation			
	Cookies	Cakes		Molds bread
		*A	**B	
Raw batter	472	683	780	771
Baked product	405	598	695	697
Yield factor	1.17	1.14	1.12	1.11
Servings*** (number)	5.1	7.5	8.7	8.7

*A: Black rice cake **B: whole oats cake

***Considering 80 g for each serving.

3.3 Chemical Composition of the study products

3.3.1 Chemical composition of cookies

Table (6) showed the proximate chemical composition of cookies. The moisture content of the wheat flour cookies was slightly significant ($p < 0.05$) compared with oats cake. This could be due to low moisture and water absorption capacity of wheat flour (**Deshmukh and Yenag, 2016**) as compared with that of whole oats flour, which found in Table (4). Also due to moisture content of applesauce, which was used as an alternative to fat in oats cake.

The fat content of wheat flour cookies (control samples) was higher than oats and applesauce cookies. This explained that the addition of whole oats flour and applesauce resulted in decrease in the fat content of the cookies (**Saeed and Salam ,. 2013**).

Oats and applesauce cookies have fiber content higher than wheat cookies (6.80 % and 3.84 %) respectively. Fibers from oat can bring important benefits to the health of the digestive tract, due to the contribution of the increase of faecal mass **Madhujith and Shahidi (2007); Inglett and Chen (2012)**.

The ash content of the control sample (100% wheat flour cookies) was the least, while those substituted with whole oats flour applesauce fat substitutions had higher ash contents. The high ash content of the samples with whole oats flour applesauce fat substitutions is an indication that whole oats and applesauce are a rich source of ash.

The protein content of the cookies increased as the proportion of whole oats flour increased. This observation is in line with (**Brennan and Cleary, 2005**) who reported that whole oats has high protein content.

The carbohydrate content of oats cookies was lower than the control cookies. This result agreed with **Okaka et al., (2009)**. The substitution of wheat flour with whole oats flour substitutions and applesauce fat substitutions in the production of cookies greatly improve their protein, fat, ash and fibre contents.

Table 6. Chemical Composition of Cookies on (Dry Basis)

Types of cookies	Moisture (%)	Protein (%)	Fiber (%)	Ash (%)	Fat (%)	Carbohydrates (%)
Wheat flour cookies	8.59	9.87	3.84	1.84	6.84	77.61
100 %Whole oats flour and 100 % applesauce Cookies	21.3	12.70	6.80	3.2	3.48	73.82

3.3.2 Chemical composition of cakes

Different compositions were found among the cakes Table (7) showed no significant variation in protein contents.

The carbohydrates content of cake decreased by using whole oats flour content in oat cake.

The highest fat content was in the wheat flour cake 9.79 % and the lowest content was in the black rice cake 5.67 %.

The content of crude fiber, ash and moisture were highest in oats cake 6.91 %, 4.1 % and 37.6 % respectively, while the black rice cake contains 2.03 %, 2.3 % and 33.8 % respectively. The lowest percentage of moisture, fiber and ash were in wheat flour cake (26.26 %, 0.70 % and 1.45) respectively. These results agree with (**Małgorzata , 2008**).

Table 7. Chemical Composition of (black rice and oats) Cakes on (dry basis)

Types of Cake	Moisture (%)	Protein (%)	Crude fiber(%)	Ash (%)	Fat (%)	Carbohydrates (%)
Control	26.26	8.97	0.70	1.45	9.79	79.80
Black Rice Cake	33.8	6.1	2.03	2.3	5.67	83.9
Oat Cake	37.6	7.4	6.91	4.1	7	74.59

3.3.3 Chemical composition of molds bread

Data in Table (8), showed the chemical composition of molds bread. The high moisture content (51.7 %) was in molds bread (75 % wheat flour82 % and 25 %wheat bran). Molds bread probably because the highest dietary fiber content can, through chemical interactions, retain water in the food matrix. The components that showed more major quantitative variations were protein, moisture, dietary fiber and carbohydrates. Considering the supplying of dietary fiber, ash and protein and low carbohydrate content one serving of molds bread with 75 % wheat flour82 % and 25 %wheat bran equivalent to 80 g can be considered an excellent source of low calorie.

Table 8. Chemical Composition of Molds bread on (Dry Basis)

Types of bread	Moisture (%)	Protein (%)	Crude fiber(%)	Ash (%)	Fat (%)	Carbohydrates (%)
100 % wheat flour72 % molds bread	37.59	7.71	1.02	2.00	2.53	86.74
25 % wheat flour82 % and 75 %wheat bran molds bread	51.7	15.35	4.67	3.00	2.46	74.52

3.4 The caloric values of studied products:

The caloric values of cookies, cake and molds bread are presented in Table 9. Cookies prepare from totally substitution of (wheat flour by whole oats flour and fat by applesauce) had the lower calories than control. The caloric values, the difference was statistically significant. This result agreed with (**Adeyeye et al., 2017**). Caloric values of two types of cakes (B, C) had significant difference ($P < 0.05$) compared with control. The whole oats flour cake was the least caloric content followed by the black rice cake. Molds bread with 75 % wheat bran and 25 % wheat flour 82% extraction as totally wheat flour 72% replacer compared to the control was shown highly significant difference in caloric value ($P < 0.01$).

These low caloric values of cookies, cake and molds bread are due to addition of dietary fiber to bakery products, which decreases the caloric density of baked goods. Applesauce in cookies is also good source of pectin compounds (**Uchoa et al., 2009 and Hussein et al., 2011**). Pectin is fermented in the intestines, producing short-chain fatty acids that prevent the growth of harmful bacteria. Apple due to soluble fiber develops high viscosity, which could reduce gastric emptiness so promoting a greater fulfillment sensation (**Marlett et al., 2002 and Donalson, 2004**).

Table9 Caloric value of Cakes, cookies and molds bread on wet basis:

Types	**Control** **Energy (Cal/100 g)**	**New Formulations** **Energy (Cal/100 g)**	
Cookies	371.8^{a}	296.7^{b}	
Cake	324.6^{a}	*A	**B
		272.5^{b}	244^{b}
Molds bread	250.3^{a}	184.4^{b}	

*A: Black rice flour cake **B: Whole oats flour cake

Notes: All data are means of three replicates expressed on wet weight basis. Values are mean ± standard deviation of triplicate determinations. Means in the same row with different superscripts are significantly different ($p \leq 0.05$).

3.4 Sensorial analysis

Table (10) showed the sensory properties of whole oats flour cookies. The wheat flour cookies used as control were rated significantly higher than the test cookies sample with totally substitutions of (wheat flour by whole oats flour and fat by applesauce) for the attributes of appearance, texture and crispiness. The cookies sample with whole oats flour and applesauce were no significantly difference from the control in colour, taste, flavor and overall acceptability. These results were disagreement with **Okoye and Obi (2017) and Maria, et al.,(2017).**

Table 10. Sensory attributes of wheat cookies and oats applesauce cookies.

Sample	Sensory attributes						
	appearance	Texture	Colour	taste	Flavor	Crispiness	overall acceptability
Control	7.38 ±1.14	7.64±0.96	7.70±0.89	7.92±1.10	7.92±1.05	5.86±2.03	8.08 ±0.97
100% oats flour and 100 % applesauce	5.62±1.40	5.87±2.23	5.75±1.58	6.68±1.09	6.87±1.35	3.86±2.00	7.00±2.00

The data were presented as mean ± S.D.

The results obtained in sensory analysis of cake produced from totally substitution of wheat flour 72% with (black rice and oats) flour were presented in **Table**11. The cake sample with 100 % black rice flour was significantly difference compared with control in appearance, color and flavor. While in taste and texture and overall acceptability there were no significant differences in control. These results were in agreement with (**Itthivadhanapong, and Sangnark, 2016**). Cake with 100 % oats flour showed no significant differences with wheat flour cake in appearance, taste and overall acceptability. While with Color, texture and flavor there were significant differences with control. These results were in agreement with (**Karaoglu and Kotancilar, 2011**).

Table 11. Sensory attributes of wheat flour 72% cake, black rice cake and oats cake.

Samples	Sensory attributes					
	appearance	Color	Taste	Flavor	Texture	overall acceptability
Control	8.37 ± 1.30	8.50 ± 1.19	8.56 ± 0.85	8.75 ± 0.70	8.1 ± 1.24	8.56 ± 0.85
100% black rice flour	6.66 ±1.38	6.94 ±1.20	6.58 ± 0.88	6.32 ±1.06	6.94 ±1.38	6.56 ±0.84
100% oats flour	7.20 ± 0.73	6.94 ± 1.38	7.20 ± 0.73	6.94 ± 1.20	5.58 ± 0.88	7.20 ± 0.73

The data were presented as mean ± S.D.

Result of sensory analysis of molds bread sample containing 75 % wheat bran and 25 % wheat flour 82% extraction as totally wheat flour 72% replacer compared to the control was shown in Table 12. The statistical analysis revealed that there was no significant difference among molds bread with 75 % wheat bran and 25 % wheat flour 82% extraction and control in irregular shape, Crust color, Taste and overall acceptability. Results revealed a significant difference in the crumb color, crumb hardness and flavor.

Table12. Sensory attributes of wheat flour 72% molds bread and wheat bran and wheat flour 82% extraction molds bread.

Sample	Sensory attributes						
	Irregular shape	Crust color	crumb color	crumb hardness	Taste	Flavor	overall acceptability
100 % wheat flour72 % molds bread	7.12 ±0.99	7.00 ± 1.6	4.01 ± 1.58	5.01 ± 1.58	5.75 ± 1.58	7.12 ±1.24	6.87 ± 0.83
75% wheat bran and 25% wheat flour 82% extraction	7.68 ± 0.82	7.62 ± 0.9	6.9 ± 1.13	5.60 ±1.74	7.58 ± 1.03	8.50 ± 0.86	7.82 ± 0.91

The data were presented as mean ± S.D

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