Effect of Enriched Gluten Free Biscuits with Chickpea Flour or Kareish Cheese on Chemical, Nutritional Value, Physical and Sensory Properties

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ABSTRACT

The purpose of this research was to investigat the effect of substitutions chickpea flour or kareish cheese with rice flour at different levels (0, 2.5,5, 7.5, 10 and 12.5%) on chemical composition, nutritional evaluation, physical and sensory properties of gluten free sweet or salty biscuits. The results showed that as a result of increasing the levels of substitutions of chickpea flour or kareish cheese, the moisture, protein, ash and fat were increased. However carbohydrates contents were decreased compared to the other control samples on both types of biscuits. So, the nutritional value of both biscuits were increased compared to the control samples. Moreover, physical properties as the diameter of both biscuits were gradually decreased, but the thickness were increased. Thus, spread ratio was decreased by increasing chickpea flour or kareish cheese. Sweet biscuits with 10% chickpea flour had the best sensory properties compared other sweet biscuits samples. Also, all salty biscuits had high sensory properties, but salty biscuits with 25% kareish cheese had the lowest properties compared to others. So, It can be formed gluten free biscuits with high nutritional value and good quality properties by adding chickpea flour by small quantity or kareish cheese by medium quantity.

Keywords: chickpea flour- kareish cheese- rice flour- sweet - salty –biscuits.

INTRODUCTION

Biscuit is one of the most commonly accepted snack foods amongst children and adult. It is considered as one of the best supplementary food for distributing to the undernourished children through developmental agencies (Mishra *et al.*, 2015). The aglutenics biscuits are intended for those people who are suffering from gluten intolerance, (named celiac disease) (MAN *et al.*, 2014*)*. Celiac Disease is a chronic entheropathy produced by gluten intolerance, more precisely to certain proteins called prolamines, which causes atrophy of the intestinal villi, malabsorption and clinical symptoms that can appear in both childhood and adulthood (Osella *et al*., 2014 *and* Miñarro *et al.,* 2012). Gluten is found in wheat, rye, barley, and other closely related cereal grains (Tsatsaragkou *et al*., 2012 and Deora *et al*., 2015).

In fact, many gluten-free products are available on the market are often of poor technological quality, exhibiting low volume, poor color and crumbling crumb, besides great variation in the nutrient composition, with low protein and high fat contents (Matos and Rosell, 2012). Thus, consumer demand is increasing for composite flour based bakery products like biscuits. Gluten-free nature can play an important role in preventing celiac problem (Baljeet *et al*., 2010). Glutinous rice flour is mainly used as a raw material in rice cakes and extruded snacks (Surojanametakul *et al.,* 2006). Protein fortification of bakery products is of current interest because of increasing awareness in the consumer towards health and quality of bakery products (Figuerola *et al.,* 2005) as biscuits can be prepared from composite flours (Mishra and Chandra, 2012) especially when cereals are blended with legumes (Oyarekua and Adeyeye, 2009) and dairy proteins (Matos *et al.*, 2014).

Legumes flour is an ideal ingredient for improving the nutritional value of bread and bakery products (Hefnawy *et al*., 2012 and Koubaier *et al.*, 2015). Chickpea (*Cicer arietinum L)* has a high protein, mostly contains high levels of complex carbohydrates (low glycemic index), is rich in vitamins and minerals and is relatively free from anti-nutritional factors (Wood and Grusak, 2007). Chickpea proteins are considered a suitable source of dietary protein due to the excellent balance of essential amino acid composition (Zhang *et al*., 2007).

Cheese has been widely used as an ingredient in various food, formulated food and prepared meals since the first recorded consumption of cheese itself. Cheese is an extremely versatile food product that has a wide range of textures, flavor and end uses. So, it is mainly to add flavor to food, texture, and nutritional quality (Lucey, 2008 and EL-Mahdi *et al.,* 2014). Kareish cheese is one of the most popular, cheaper rich in nutrients and the oldest cheese in Egypt. It is a soft acid cheese made from naturally fermented skimmed milk and low fat. It comprises about 50% of white soft cheese (Romeoih *et al*., 2002, Hegazy *et al*., 2012 and El-Khawas and Hassaan, 2015).

For these reasons this investigation was done to produce baked products like gluten free biscuits (sweet biscuits) by substituting chickpea flour with rice flour at 0, 2.5, 5, 7.5, 10 and 12.5%. In addition, to produce acceptable, oriental and healthy salty biscuits by substituting chickpea flour with rice flour at 5% and kareish cheese at 0, 2.5, 5, 7.5, 10 and 12.5%. Then studying the effect of substitution on quality attributes of both samples of biscuits as chemical composition, nutritional value, physical and sensory properties.

MATERIALS AND METHODS

Materials:

Rice, peeled roasted chickpea, kareish cheese without salt, sugar, mixed spices (fennel and cumin at 1:1), salt, egg, butter, sunflower oil, full fat milk powder, vanilla, baking powder and were obtained from the local supermarket.

Methods:

Preparation of composite flour:

Peeled roasted chickpea or rice was milled by house mincer.

Preparation of sweet biscuits and salty biscuits:

Sweet and salty biscuits were prepared according to the formula shown in Table (1). Biscuits were prepared according to the procedure described by AACC (2000). Butter, oil and sugar or butter, oil and kareish cheese were creamed. Other dry ingredients were added to the cream. Then the dough was shaped as circles an outer diameter of 60 mm with 3 mm thickness. Then, the tow types of biscuits were baked at 180 to 190 C for 20 min. Finally, after cooling at room temperature biscuits samples were packed in low density polyethylene bags for further analysis of chemical, physical, and sensory proparties.

Chemical analysis:

Moisture, protein, ash and fat of biscuit samples were determined according to the method described by A.O.A.C. (2005). Total carbohydrate was calculated by differences.

Physical properties of biscuits:

Sweet and salty biscuits were analyzed for width, thickness and spread ratio was calculated by dividing the average value of diameter by average value of thickness of biscuits as described by A.O.A.C. (2005). The baking loss of biscuits was calculated by weighing five biscuits before and after baking. The difference in weight was averaged and reported as a percentage of baking loss as described by Chauhan *et al*., (2016).

Sensory properties of biscuits:

Sensory properties of all sweet or/ and salty biscuits as color, texture, flavor, crispiness and general acceptability were determined as the method described by Ihekoronye and Ngoddy (1985).

Nutritional value of biscuits:

The energy value of biscuit samples was calculated as described by A.O.A.C (2005). Grams consumed to cover the daily requirement (GDR) both energy and protein. Percent of satisfaction of protein and energy when consumed 100 g from biscuits samples (ps/100) from gram consumed to cover the daily requirements of energy value and protein for children (3-6 years) were calculated by using recommended daily allowance (RDA) as described by Anon, 1989.

Table 1: The formula of sweet and salty biscuits samples:

Ingredient	Sweet biscuits						Salty biscuits					
	RBC	RB1	RB2	RB3	RB4	RB5	SRBC	SRB1	SRB2	SRB3	SRB4	SRB5
Rice flour	50	47.5	45	42.5	40	37.5	52.14	49.64	47.14	44.64	42.14	39.64
Chickpea flour		2.5	5	7.5	10	12.5	5	5	5	5	5	5
Cottage Cheese	--	--	--	--	--	--	0	2.5	5	7.5	10	12.5
Sugar	15	15	15	15	15	15	1.13	1.13	1.13	1.13	1.13	1.13
Butter	7.5	7.5	7.5	7.5	7.5	7.5	8.57	8.57	8.57	8.57	8.57	8.57
Sunflower oil	2.5	2.5	2.5	2.5	2.5	2.5	2.86	2.86	2.86	2.86	2.86	2.86
Full fat milk powder	2.5	2.5	2.5	2.5	2.5	2.5	2.86	2.86	2.86	2.86	2.86	2.86
Hen egg (whole)	12.5	12.5	12.5	12.5	12.5	12.5	14.29	14.29	14.29	14.29	14.29	14.29
Baking powder	2	2	2	2	2	2	2.29	2.29	2.29	2.29	2.29	2.29
Vanilla	0.12	0.12	0.12	0.12	0.12	0.12	0.14	0.14	0.14	0.14	0.14	0.14
Mixed spics (feennel and cumin at 1:1)	--	--	--	--	--	--	1.29	1.29	1.29	1.29	1.29	1.29
Salt	0.38	0.38	0.38	0.38	0.38	0.38	0.86	0.86	0.86	0.86	0.86	0.86
Water	7.5	7.5	7.5	7.5	7.5	7.5	8.57	8.57	8.57	8.57	8.57	8.57
Total	100	100	100	100	100	100	100	100	100	100	100	100

RBC: Rice biscuit control. RB1: Rice biscuits with 5% chickpea flour. RB2: Rice biscuits with 10% chickpea flour. RB3: Rice biscuits with 15% chickpea flour. RB4: Rice biscuits with 20% Chickpea flour. RB5: Rice biscuits with 25% chickpea flour. SRBC: salty rice biscuits control- SRB1: Rice biscuits with 10% chickpea flour and 5% kareish cheese. SRB3: Rice biscuits with 10% chickpea flour and 10% Kareish cheese. SRB4: Rice biscuits with 10% chickpea flour and 15% kareish cheese. SRB5: Rice biscuits with 10% chickpea flour and 20% kareish cheese.

Statistical analysis

All Data were analyzed using the software, statistical package for social science (SPSS) version 11.00 SPSS inc., Chicago, IL, USA at the 0.05 level. The results were expressed as means ± stander deviation (SD). Data were analyzed by using one-way analysis of variance (ANOVA) for continuous variables. *P* values <0.05 were considered to be statistically significant.

RESULTS AND DISCUSSION

Chemical composition of raw materials used in preparation:

Data presented in Table (2) showed that rice flour had the highest content of carbohydrate and the lowest contents of protein, fat and ash compared to the other raw samples. On the other hand, kareish cheese had the highest contents of moisture, protein, ash and fat and the lowest content of carbohydrate. The result of the chemical composition of chickpea flours was confirmed by those of El-Shimy (2013) and Osorio-Díaz *et al*.,(2008) and Wani and Kumar (2014). The chemical composition of kareish cheese is in agreement with those of Ghada *et al*., (2004), and Awad *et al*., (2015) and El-Sayed *et al*., (2016). The result of rice flour chemical compostion was in agreement with those of Turabi *et al.*, (2008).

Chemical composition of sweet and salty biscuit (dry weight basis).

Data found in Table (3) showed that there were slightly increased in moisture, protein, fat and ash contents, but there was slightly decreased in carbohydrate contents in both sweet and salty biscuits as increasing chickpea flour in sweet biscuits or increasing in karisk cheese levels in salty biscuits. The increasing in moisture content were due to increasing in levels of chickpea flour or kareish cheese as a result of increasing protein content in both kinds of biscuits. These results due to the fact that protein has high capability to absorb more water in products which cause increasing in moisture.

All these results agree with those of Rababah *et al*., (2006) and Saleh *et al*., (2012) they stated that the increase in moisture in biscuits could be due to the presence of polar amino acids and the positive influence of increasing levels of protein on water-holding capacity.

Table 2: Chemical composition of raw materials used in biscuits preparation on dry wieght

Constituents	Moisture (%)	Dry matter	Protein (%)	Fat (%)	Ash (%)	Carbohydrate (%)
Rice flour	b8.59 ±0.01	b91.41 ±0.11	c6.21 ±0.16	c1.22 ±0.26	c0.35 ±0.23	a92.24 ±0.1
Chickpea flour	c7.58 ±0.12	a92.42 ±0.12	b24.56 ±0.53	b7.52 ±0.53	b3.74 ±0.16	b64.18 ±0.08
Kareish cheese	a81.75 ±0.65	c18.25 ±0.65	a65.75 ±0.05	a8.38 ±0.35	a11.23 ±0.058	c14.64 ±0.14
P<	***	***	***	***	***	***

Each record is a mean value of three replicates and is followed by the stander deviation (SD). (a, b, c, d, e, and f): means in the same column with different superscript differ significantly at p< 0.05. *P< 0.05. **P< 0.01. *** P< 0.001.

Table 3: Chemical composition of sweet and salty biscuits on dry weight

Samples	Sweet biscuits					
	Moisture	Dry matter	Protein	Fat	Ash	Carbohydrates
RBC	d5.14 ±0.15	a94.86±015	f 7.93±0.17	d 19.42±0.07	F 0.94±0.12	a71.71±0.22
RB1	cd5.34±0.08	ab 94.66±0.08	e 8.54±0.06	d 19.49±0.08	e1.06±0.05	b70.91±0.18
RB2	c5.56±0.20	b 94.44±0.2	d 8.99±0.14	d19.58±0.07	d1.20±0.05	c70.23±0.22
RB3	b5.89 ±0.08	c 94.11±0.08	c 9.74±0.12	c 19.77±0.06	c1.32±0.03	d69.17±0.17
RB4	b6.12±0.05	c 93.88±0.05	b 10.36±0.04	b 19.96±0.11	b1.47±0.02	e68.21±0.09
RB5	a6.50±0.12	d 93.50 ±0.12	a 10.74±0.14	a 20.2 ±0.09	a1.59±0.06	f67.47±0.15
P<	***	***	***	***	***	***
	Salty biscuits					
SRBC	e5.25±0.05	a94.75±0.05	f8.87±0.06	f19.53±0.07	f1.57±0.08	a70.03±0.08
SRB1	d5.70±0.05	b94.3±0.05	e10.03±0.15	e21.04±0.06	e1.89±0.05	b67.04±0.05
SRB2	c6.75±0.16	bc93.25±0.16	d10.71±0.04	d21.94±0.11	d2.03±0.14	c65.32±0.14
SRB3	b8.04±0.08	d91.96±0.08	c11.48±0.06	c22.97±0.05	c2.17±0.02	d63.38±0.07
SRB4	a9.19±0.09	e90.81±0.09	b12.27±0.26	b24±0.89	b2.36±0.03	e61.37±0.01
SRB5	a9.30±.04	e90.70±0.04	a12.5±0.55	a25.52±035	a2.64±0.53	f59.34±0.76
P<	***	***	***	***	***	***

RBC: Rice biscuit control. RB1: Rice biscuits with 5% chickpea flour. RB2: Rice biscuits with 10% chickpea flour. RB3: Rice biscuits with 15% chickpea flour. RB4: Rice biscuits with 20% Chickpea flour. RB5: Rice biscuits with 25% chickpea flour. SRBC: salty rice biscuits control- SRB1: Rice biscuits with 10% chickpea flour and 5% kareish cheese. SRB3: Rice biscuits with 10% chickpea flour and 10% Kareish cheese. SRB4: Rice biscuits with 10% chickpea flour and 15% kareish cheese. SRB5: Rice biscuits with 10% chickpea flour and 20% kareish cheese.

Each record is a mean value of three replicates and is followed by the stander deviation (SD). (a, b, c, d, e, and f): means in the same column with different superscript differ significantly at p< 0.05. *P< 0.05. **P< 0.01. *** P< 0.001.

It is taking into consideration the high moisture content associated with using the chickpea flour at different replacement levels, due to higher hydration rate that is associated with higher protein content. Furthermore, the result of salty biscuits is in agreement with those of An *et al*., (2005) they found that that dairy protein characterized by the great water binding capacity and the ability to form a gel-like structures.

All the results about the effect of substituting chickpea flour with rice on sweet biscuits chemical compostion conformed with those of Mishra and Chandra (2012) Saleh *et al.,* (2012), Yamsaengsung *et al.,* (2012), El-Shimy (2013), Izembaeva *et al.,* (2013) and Patil *et al.,* (2016) they found that the incorporation of high protein legumes as chickpea flour can improve the nutritional value of cereal or gluten-free biscuit in particular, which are up to now often of poor quality. All the results about the effect of substituting chickpea flour with rice flour and kareish cheese on salty biscuits chemical compostion are in agreement with those of Gularte *et al.,* (2012) they found that the incorporation of dairy proteins in the bakery products increased the protein content and complement the nutritional value of cereal proteins.

Nutritional value of the tested samples biscuits:

Data given in Table (4) presented that one serving (100g) of both sweet and salty biscuits and its percent of satisfaction percentage (PS/100g) for children 3-6 years were slightly increased in (PS/100g) of protein, so the GDR protein value was slightly decreased as increasing chickpea flour levels in sweet biscuits or increasing in kareish cheese levels in salty biscuits. But, the energy values (Kcal /100g) of both biscuits were decreased, so GDR energy values were increasing in both biscuits. These results were due to slightly increasing protein and the decreasing carbohydrate content in both biscuits as found in Table (3). But, the percentage of one serving 100g (PS/100g) of salty biscuits samples was more than that of sweet biscuits, because salty biscuits had more protein, fat contents and energy value (Kcal /100g) than those of sweet biscuits samples.

All the results about sweet biscuits are in agreement with those of Oyarekua and Adeyeye, (2009) they reported that composite flour has the added advantages of improving the nutrient value of biscuits and other bakery products, especially when cereals are blended with legumes. Also, the results about salty biscuits are confirmed by those of Ghada *et al*., (2004), Gularte *et al*., (2012) and EL-Mahdi *et al.,* (2014).

Physical properties of biscuits

Data available in Table (5) displayed that the diameter of sweet biscuits were decreased, but the thickness was increased so, spread ratio was decreased as increasing chickpea flour levels in sweet biscuits or as increasing kareish cheese levels on salty biscuits samples.

Table 4: Energy value, GDR and PS/100g (protein and energy value) of biscuits samples in wet weight for children 3-6 years

Constituents	Sweet biscuits					
	Protein (GM)	PS protein /100g	GDR protein	Kcal /100g	PS energy /100g	GDR energy
RDA	24	--	--	--	1800	--
RBC	f7.52 ±0.14	a26.5 ±.006	a319.08 ±2.89	a477.40 ±0.99	f31.37 ±0.58	d377.04 ±0.78
RB1	e8.08 ±0.51	ab26.45±.00	b296.92 ±1.88	a476.17±0.16	e33.68 ±0.22	cd378.03±0.12
RB2	d8.49 ±0.11	cb26.39±0.06	c282±0.69	cb475.03 ± 0.17	d35.38 ±0.46	cb378.93±0.94
RB3	c9.17 ±0.1	cd26.32±0.02	d261.84±2.84	c473.78±0.47	c38.20 ±0.42	b379.92±0.38
RB4	e9.73 ±0.03	ed26.28±0.04	e246.74±0.77	c473.06±0.7	b40.53 ±0.13	ab380.51±0.56
RB5	a10.04 0.14	e26.20±0.05	e238.99±.3.21	d471.69±0.95	a41.85 ±0.57	a381.66±0.77
P<	***	***	***	***	***	***
	Salty biscuits					
SRBC	f8.40 ±0.06	e26.72±0.01	a285.71±1.88	e480.98±0.18	f35.02 ±0.01	a374.24±.14
SRB1	e9.46 ±0.16	b26.99±0.03	b253.70±4.5	b485.83±0.48	e39.42 ±0.63	d370.50±0.34
SRB2	d9.99 ±0.05	c26.93±0.02	c240.24±1.1	c484.63±0.39	d41.63 ±0.19	c371.42±0.3
SRB3	c10.56 ±0.05	d26.81±0.02	d227.27±0.98	d482.64±0.38	c44 ±0.19	b372.95±0.3
SRB4	b11.14 ±0.03	e26.74±004	e215.44±0.67	e481.27±0.82	b46.41 ±0.14	a373.98±0.63
SRB5	a11.34 ± .05	a27.09±0.01	e211.70±0.94	a487.57±0.23	a47.24 ±0.01	e 369.17±0.94
P<	***	***	***	***	***	***

RBC: Rice biscuit control. RB1: Rice biscuits with 5% chickpea flour. RB2: Rice biscuits with 10% chickpea flour. RB3: Rice biscuits with 15% chickpea flour. RB4: Rice biscuits with 20% Chickpea flour. RB5: Rice biscuits with 25% chickpea flour. SRBC: salty rice biscuits control- SRB1: Rice biscuits with 10% chickpea flour and 5% kareish cheese. SRB3: Rice biscuits with 10% chickpea flour and 10% Kareish cheese. SRB4: Rice biscuits with 10% chickpea flour and 15% kareish cheese. SRB5: Rice biscuits with 10% chickpea flour and 20% kareish cheese.

RDA: recommended daily allowance GDR: Grams consumed to cover the daily requirement. Ps: Percent of satisfaction

Each record is a mean value of three replicates and is followed by the stander deviation (SD) (a, b, c, d, e, and f): means in the same column with different superscript differ significantly at p< 0.05. *P< 0.05. **P< 0.01. *** P< 0.001. ****P< 0.0 001

Table 5: physical properties of the tested samples biscuits

Samples	Diameter (cm)	Thickness (cm)	Spread ratio	% Baking loss
	Sweet biscuits			
RBC	a5.14±0.1	c0.68±0.1	a7.56 ±0.11	a15.68 ±0.15
RB1	ab5.1±0.1	c0.69±0.00	ab7.39±0.15	b14.14 ±0.16
RB2	b5.05 ±0.05	cb0.7 ±0.01	b7.21±0.95	b13.94±0.08
RB3	c4.98 ±0.1	ab0.72±0.1	c6.92±0.08	c13.52 ±0.72
RB4	c4.96 ±0.04	a0.73 ±0.1	c6.79±0.16	d12.18 ±0.45
RB5	d4.78±0.17	a 0.74±0.1	d6.46±0.89	c11.85 ±0.5
P<	***	***	***	***
	Salty biscuits			
SRBC	4.89±0.23	c0.75±0.1	a6.52±0.61	c46.57±0.40
SRB1	4.85±0.07	b0.82±0.04	b5.92±0.24	c46.91±0.12
SRB2	4.8±0.05	ab0.86±0.10	bc5.58±0.13	c47.48±0.27
SRB3	4.8±0.1	a0.89±0.01	c5.35±0.12	b48.68±0.69
SRB4	4.8±0.1	a0.9±0.02	c5.33±0.06	b49.54±0.56
SRB5	4.79±0.16	a0.92±0.03	c5.21±0.32	a50.98±0.17
P<	--	***	***	***

RBC: Rice biscuit control. RB1: Rice biscuits with 5% chickpea flour. RB2: Rice biscuits with 10% chickpea flour. RB3: Rice biscuits with 15% chickpea flour. RB4: Rice biscuits with 20% Chickpea flour. RB5: Rice biscuits with 25% chickpea flour. SRBC: salty rice biscuits control- SRB1: Rice biscuits with 10% chickpea flour and 5% kareish cheese. SRB3: Rice biscuits with 10% chickpea flour and 10% Kareish cheese. SRB4: Rice biscuits with 10% chickpea flour and 15% kareish cheese. SRB5: Rice biscuits with 10% chickpea flour and 20% kareish cheese.
Each record is a mean value of three replicates and is followed by the stander deviation (SD). (a, b, c, d, e, and f): means in the same column with different superscript differ significantly at p< 0.05. *P< 0.05. **P< 0.01. *** P< 0.001.

On the other hand, % baking loss of sweet biscuits was decreased as increasing levels of chickpea flour. This result was due to chickpea flour had low moisture and more protein persentage compared to rice as shown in Table (2). On the other hand, % baking loss of salty biscuits was increased. This result was due to kariesh cheese has more moisture compared to rice flour in dough. These results were due to increase protein content which had the ability to bind water absorption and the hydrophilic nature of the flour chickpea in sweet biscuits. These result are in agreement with those of Thongram *et al*., (2016) and Mariotti *et al*., (2009). Besides, the result about salty biscuits is confirmed by those of Gallagher *et al*., (2005) and Hussein *et al*., 2008).

Sensory evaluation of biscuits:

Data presented in Table (6) showed that darker yellowness, darker color and aroma were increased by increasing the level of substitution of chickpea flour. These results may be due to increasing fiber and carotenoids. This result confirmed with those by Hu *et al.* (2007) and Fărcaş *et al*. (2014). Hardness and aroma were increased by increaseing chickpea flour levels. This result is in agreement with those of Yamsaengsung *et al.,* (2012). All formulas of biscuits were acceptable, but the best form of sweet biscuit which had 10% chickpea flour. This result confirmed with those of Ahmad and Ahmed, (2014) they reported that supplementary food should be such, if taken in small quantity, could provide the necessary amount of nutrients. They should be made in the form of ready to eat snacks, drinks. All these results are confirmed by those of Sulieman *et al*., (2013) Izembaeva *et al*., (2013) and Man *et al*., (2015).

The acceptability of salty biscuits was increased by increasing kareish cheese levels because all properties of salty biscuits were improved. These results due to the functionality of milk constituents. Proteins, fat, lactose and minerals have a profound positive influence on the quality of non-dairy food product, when dairy ingredients are used in such product mix (Krupa *et al.,* 2011 and (EL-Mahdi *et al.,* 2014). Also, crust darkening is increased this result due to maillard reactions this result is in agreement with those of De Mesa-Stonestreet *et al*., 2012 and Krupa *et al*., 2011).

All these results are confirmed by those of Mariotti *et al*., (2009) they reported that incorporation of starches of different origin, dairy proteins, other non-gluten proteins into a gluten free flour base (mostly rice and corn flour) that could result in maintaining the structure, mouth feel, acceptability and shelf-life of the finished products. Also, Izembaeva *et al*., (2013) reported that proteins do not only play an important role in the body, but also in the technological process to prepare the dough, in the formation of flavoring and aromatic substances, baking cookies, determine many important consumer properties of food products.

Table 6: Sensory evaluation of the tested samples biscuits.

Samples	Sweet biscuits						
	Color	**Taste**	**Aroma**	**Criccpess**	**Texture**	**Crust**	**Acceptability**
RBC	a8.8±0.42	ab7.9±0.32	a9.1±0.57	c7.6±0.52	c6.8±0.42	ba8.1±0.32	cb7.98±0.2
RB1	a8.8±0.62	ab7.9±0.74	ab8.9±0.57	ab8.2±0.79	ba7.5±0.53	a8.4±0.52	ba8.22±0.37
RB2	ab8.5±0.42	a8.1±0.57	ab8.75±0.72	a8.5±0.53	ba7.5±0.57	a8.45±0.60	a8.35±0.19
RB3	ab8.13±0.32	cb7.25±0.64	cb8.25±0.43	a8.75±0.9	abc7.4±0.52	b7.51±0.47	c7.87±0.15
RB4	ab8.13±0.49	c7.18±0.34	c7.75±0.64	a8.95±0.5	cb7.13±0.5	b7.65±0.47	cd7.78±0.22
RB5	b8±0.67	c7.0±0.67	d6.5 ±0.53	a9±0.82	cb7±0.47	b7.75±0.64	d7.54±0.28
F	3.662	6.706	27.911	5.485	6.124	6.124	14.438
P<	**	***	***	***	***	***	***
	Salty biscuits						
SRBC	8.0±0.47	c8.1±0.32	c8.2±0.42	ab8.5±0.53	c8±0.67	a8.4±0.52	c8.20±0.23
SRB1	8.4±0.52	c8.3±0.48	cb8.5±0.71	ab8.2±0.63	cb8.5±0.71	ab8.2±0.79	ab8.35±0.43
SRB2	8.4±0.7	cb8.6±0.52	bc8.75±0.62	ab8.1±0.99	ba8.9±0.57	ab7.95±0.6	ab8.45±0.24
SRB3	8.4±0.7	ba9.1±0.88	ba8.98±0.41	ab7.85±0.24	ba9.2±0.42	ab7.71±0.48	ab8.54±0.33
SRB4	8.45±0.5	a9.3±0.48	a9.5±0.53	b7.5±0.53	ba9.15±0.63	c7.55±0.5	a8.58±0.58
SRB5	8.6±0.7	a9.35±0.47	a9.6±0.52	b7.45±0.5	a9.3±0.48	c7.5±0.53	a8.63±0.17
F	1.083	9.351	10.198	4.524	7.318	3.969	3.407
P<	---	***	***	***	***	**	**

RBC: Rice biscuit control. RB1: Rice biscuits with 5% chickpea flour. RB2: Rice biscuits with 10% chickpea flour. RB3: Rice biscuits with 15% chickpea flour. RB4: Rice biscuits with 20% Chickpea flour. RB5: Rice biscuits with 25% chickpea flour.SRBC: salty rice biscuits control- SRB1: Rice biscuits with 10% chickpea flour and 5% kareish cheese. SRB3: Rice biscuits with 10% chickpea flour and 10% Kareish cheese. SRB4: Rice biscuits with 10% chickpea flour and 15% kareish cheese. SRB5: Rice biscuits with 10% chickpea flour and 20% kareish cheese.

Each record is a mean value of ten replicates and is followed by the stander deviation (SD). (a, b, c, d, e, and f): means in the same column with different superscript differ significantly at p< 0.05. *P< 0.05. **P< 0.01. *** P< 0.001.

CONCLUSION

Substitution gluten free as rice by chickpea flour or kareish cheese to produce baked products like sweet and salty biscuits. It can produce gluten free biscuits with high nutritional value, high physical and sensory propertie, by adding chickpea flour by small quantity or kareish cheese with medium quantity.

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الملخص العربي

تأثير تدعيم البسكويت خالى الجلوتين بدقيق الحمص والجبن القريش على التركيب الكيميائى والقيمة الغذائية والخواص الفيزيقية والحسية

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الهدف من هذا البحث هو دراسة مدى تأثير إضافة دقيق الحمص أو جبن القريش بدلا من دقيق الارز بنسب (٠، ٢.٥,٥ ،٧.٥، ١٠، و١٢.٥%) على كل من التركيب الكيميائى والقيمة الغذائية والخواص الفيزيقية والحسية للبسكويت الحلو والمالح خالى الجلوتين. وأظهرت النتائج انه نتيجة لزيادة نسب الإضافة حدث ارتفاع تدريجى فى محتواها من الرطوبة والبروتين والدهن والرماد فى كل من البسكويت الحلو والمالح، بينما حدث انخفاض فى محتواها من الكربوهيدرات بالمقارنة البسكويت غير مدعم. ولذلك إرتفعت القيمة الغذائية للبسكويت المالح والبسكويت الحلو بالمقارنة بالبسكويت الكنترول لكل منهما. وعلاوة على ذلك وبدراسة الصفات الفيزيقية اوضحت النتائج انه حدث انخفاض فى القطر بينما حدث ارتفاع فى السمك وبالتالى حدث انخفاض فى معامل الانتشار، كما حدث انخفاض فى معدل فاقد الخبز فى الفرن كلما زاد معدل الإستبدال من دقيق الحمص أو جبن القريش. كما وجد ان البسكويت الحلو المحتوى على ١٠% دقيق حمص أظهر افضل النتائج الحسية. كما وجد ان جميع انواع البسكويت المالح اظهرت درجة عالية من الخواص الحسية والتقبل العام، إلا ان البسكويت المملح المحتوى على ٢٥% الجبن القريش كان أقلهم فى الخواص الحسية. نستخلص من ذلك إمكانية عمل خلطات من البسكويت خالى الجلوتين ذات قيمة غذائية عالية، وصفات جودة عالية وذلك بإضافة دقيق الحمص بنسب قليلة وإضافة الجبن القريش بنسب متوسطة.