International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

The Effect of Substitution of Wheat Flour in Different Proportions of Barley Flour in the Rheological Properties of Dough and Bread's Sensual Properties

Dr. Hamdia Mohammed Shahwan Al-Hamdani[1], Dr. Salim Salah Hussian Al-Temmemi[2]
Market Research and Consumer Protection Center, Baghdad University, Iraq

Abstract: ***The objectives of this study was to investigate the physico-chemical and sensory properties of bread supplemented with seven different levels (control, 10%, 20%, 30%, 40%, 50% and 60%) of barley flour. And the other objective was to show the fake of backers about spongy barley bread that is available in Iraqi local market as healthier bread. The physical (weight, loaf volume and specific volume) and chemical (moisture, protein, ash, gluten, fat and fatty acids) analysis were determined in different flour. The bread making was led according to the French test NFV03-716. Sensory evaluation of dough, bread, crumb and volume were conducted on the control, real barley bread and supplemented bread. It was found that increasing the level of supplementation from 10% to 60% barley flour significantly ($p<0.05$) increased percent water absorption, development time and stability time of the dough, and significantly decreased degree of the softening ($p<0.05$). Loaf volume and specific volume of supplemented bread were significantly different ($p<0.05$) compared with control and barley bread treatment. Sensory evaluation shows that bread with 10-40% barley flour was rated the most acceptable and was not significantly different in terms of acceptability compared to the control and real barley flour. Also, it was found that barley bread in Iraqi local market was fake barley bread and sold as barley bread.***

Keywords: Barley bread-Wheat bread-physicochemical analysis- Sensory evaluation-Fake barley bread

1. Introduction

Bread is a staple food prepared by baking dough of flour, water and some of salt which is rich in calories and widely consumed in Iraq, as a part of the Iraqi culture, it is eaten at each meal. In Iraq, wheat products especially bread has an importance in diets, 65% of the energy consumed per capita is supplied from cereal (bread and rice) and 55% of this energy is supplied only from breads (FAO, 1982). Bread can have different topping, fillings, shapes, and textures. The Iraqi baked products market especially at the capital of Iraq, Baghdad, has grown significantly from last century till now because of several factors such as the increase in purchasing power and options in the market, technological improvements, and appeal for healthy foods. During the last years, there is a renewed interest in the use of barley flour by modern bakeries located inside Baghdad by its wealth protocols (vitamin E) and soluble fiber (ß-glucans) and minerals. Barley is a cereal grain which belongs to the family of Poacea, the Triticeae tribe and Hordeumvulgare genus. Barley is a rich source of soulable and insoulable fiber (Gary, et, al.1982). B-glucan, a soluble fraction is responsible for lowering serum cholesterol and blood glucose (Behall, et al. 2001and 2004).Hence, the ß-glucans component expressed an important feature of barley bread (Joseph, et al. 2007; Aziz and Mohammed 2013). Also, soluble fiber retards intestinal transit and is partially fermented in large intestine which produced low molecular weight of volatile fatty acids which is very important in lowering serum cholesterol and blood glucose (Mishra, et al. 2010). The use of barley flour for bread making has been the subject of several studies In Iraq (Sabeha, 2010 ;Makarim, et al. 2012). All of these studies showed that the incorporation of barley flour more than 15% resulted in an unacceptable qualitative change. Also, there were many studies worldwide showed the same thing that over 20% of barley flour addition to wheat flour affect the quality of bread unpleasant (Aziz and Mohammed 2013 ;Bhatty, 1968). But, the bakery markets of Baghdad offered barley bread look like wheat bread just it has a brown color. The person who specialized in baking goods processor can distinguish the Commercial Fraud at a glance. So that, this study to seek this phenomenon and to collect many flour's sample from many different bakery shops at Baghdad city and from rural regions to search the physic-chemical and rheological properties of the dough to decide that is wheat or barley flour. In addition, here tried very hard to get on the type of real flour bag, which imports from Turkey to work bakery product process through some friends and associates truthful, as is evident in the picture shown as wheat flour and not barley Fig.1. But the bakers offer it for sale on the grounds that barley bread. Therefore, our main objectives were to study the physicochemical analysis between wheat flour and Defendant barley flour. The other objective is to study the effect of barley flour incorporation on quality and sensory evaluation of bread. The last an important objective is to declare the truth of the defendant barley bread in the local market which is a great calamity sold as healthy bread for obese and diabetes persons.

2. Materials and Methods

Material

Common wheat flour TWF used widely in Iraq under the name "Bushler" that was imported from Turkey; other source is from Al-Bashaer mill that milled ad mixed different kind of local wheat seed IWF. The barley seed of variety "Brear" was obtained from Agriculture Research Center/Baghdad city/Iraq. Then barley seeds were cleaned, dehlled and finally milled into flour 70% through sieve 8xxx with Laboratory mill (Retsch Germany, RetschRm200 www.retsch.com) to get very fine particles. The added materials used in bread

processing i.e. fresh yeast, salt, and bread improver, were provided by bakery in Baghdad. Baker's yeast was stored, before use, at 4° C following the label guidelines. The improver incorporated at a level of 0.2% consists of wheat flour 83.5%, ascorbic acid 4%, malt 10% and alpha-amylase(2.5%).

Composite flour preparation

Ten blends were prepared by homogenously mixing different percentage of barley flour with wheat flour as in table 1 using a Kenwood food processor (Model A 907 D, Kenwood Ltd, England).

2.2 Methods

All data measured are means of at least duplicate measurements unless stated otherwise.

Chemical analysis:

The moisture, ash and fat contentwere determined according to AOAC (1990) standard method. Moisture was determined using hot air oven at 100-105 ° C for 4 hours (AOAC, method 925.40). Protein content (5Nx6.25) was determined by Kjedahl method (AOAC, Method 920.39).The ash content was measured according to dry ashing procedure (AOAC, Method 7.504).Total fat and fatty acids was determined by the Soxhlet extraction method to obtained 200 mg. The extracted fat (80 ml) was transferred to esters, and concentrations of fatty acid s in the form of methyl-esters (FAMEs) were specified by gas chromatography analyzer GC-2010 (Shimadzu, Japan) with flame ionization detector (FID). The method with an addition of internal standard (C15:0) was used. The GC-2010 system was equipped with an auto sampler and auto injector. The injection volume was 1µl. The total split flow was 90 ml/min. Helium was used as the carrier gas. Air and hydrogen gases were used as auxiliary gases. The FAMEs were separated on a column VB-VAX (60 m length; 0.25 mm ID; 0.25µm film thickness). The FID temperature was set at 300ºC, initial injector temperature was 280ºC and pressure was 299.2 kPa, initial column temperature was 70ºC. The data were processed by a computer using data processor GC solution Post run (IUPAC, 1079).

Determination of % gluten in flour

About 20 g of each composite flour sample and barley flourwere weighed onto a Petri dish of known weight and thoroughly mixed with 1 ml of water to form dough. The dough is kneaded under running water to remove starch and later put into Petri dish and weight. It was then dried in an oven (LCON53CF, Genlab, England) and weighed after drying (method 38-10,AACC 2000).The % glutein is calculated as follow:

% wet glutin=weight of glutin/weight of original flour× 100

Physical characteristics:

The particle size of WF and BF was determined according to the method published by the Iraqi Standard NM 08.1.224 (IS) using sieve analysis (plansifter laboratory model MLU-300). The particle size is defined as the quantity of ground cereals remaining is sieves of specific mesh aperture after the sieving process, plus the screening of the finest sieve used. Different blends were tested for bread making quality. Color of the fractions was measured with General State Company of Cereal Technology Laboratory with Hunterlab and Agtrol Colorimeters. In the latter method dry fractions were used, and the Agtron was standardized with nos. 63 (0%) and 97 (100%) disk (AACC, 1969). Compsite flour were prepared by adding 0, 10, 20, 30, 40, 50, and 60% barley flour (Braer) to commercial untreated wheat flour, and read baking quality was determined using the straight-dough method (AACC, 1969). The standard baking formula optained in addition 15 ppm potassium bromate and 0.5% sodium tearyl 2-lactylate (SSL). Water absorption was about 61% in each case. LoafLoaf volume (ml) of baked bread was determined by rapeseed displacement method according to (Pyler, 1988), the loaf weight of bread was measured in (gm). And the bread was scored for shape, crust color, crumb color and texture. Dough properties of the composite flours were determined at 65% absorption with a Swenson mixograph. The mixograph curve was measured for time to reach maximum height (dough development time), peak height and curve area.

Farinograph water absorption

The farinograph water absorption (FWA) was determined for different blends to foretell the hydration rate for bread making procedure. FWA is the volume of water, expressed in ml/100 g of flour at 14.0% moisture content, required to produce dough with a maximum consistency of 500 FU (Farinograph Unit) under the operating condition specified by the Iraqi standard NM 08.1.245 (AACC, 1984).

Bread making

Bread was produced using the straight dough process. Baking testwas carried out under laboratory conditions to optimize baking condition prior to actual runs. Flour and dough weighing was carried out on laboratory-scale. Dough was mixed to optimum consistency in a Kenwood mixer (Model A 907 D, Kenwood Ltd., England) with low speed of 85 rpm/1 min., kneaded and left to proof for 15 min. After proofing the dough was scaled into 500 g portions, manually rounded, then rolled and put in tin baking pans (75 min, on 30°C, and 80% relative humidity). Baking was done at 230°C in an electric oven (Electric oven SL-9 Infrared Food Oven, Hubert, China) until the golden brown color is formed. The resulting bread samples were cooled to room temperature 37°C/2 h before further analysis were carried out.

Evaluation of the physical properties of bread samples

Loaf weight: Bread loaves were weighted 20 min after baking in grams.

Loaf volume: Loaf volume was determined using rapeseed displacement method (AACC, 2000, Standard 10-05). Rapeseed were loaded into an empty box with calibrated mark until it reached the marked level and unloaded back again. The remaining rapeseed left outside the box was measured using measuring cylinder and recorded as loaf volume in cm^3.

Specific volume: Bread height and diameter was measured using a measuring ruler. Loaf shape was measured in terms of height to diameter ratio while specific volume was thereafter calculated as volume to mass ratio (cm^3/g).

Sensory evaluation

For sensory evaluation, Control, barley and composite (Barley and wheat flour) bread samples were served at room temperature in duplicate. Ten panelists were chosen who were familiar with bread. Ages ranged from 25 to 40. Four of them were male. All panelists were non-smokers. Instructions were given in full to panelists beforehand. Examinations took place in tasting booths under normal white illumination. Final judgment was obtained by averaging the scores given by all panelists. Barley flour-supplemented wheat flour samples were evaluated on a scale of 1 to 5 for five quality parameters (Exterior appearance: volume, crust color, regulatory grilling, break and shred, smoothing the surface, and regulatory. Interior appearances: crump granulation, crump color, texture tenderness, flavor and taste) were assessed for all sampled and control within 3-6 h. of baking (Anonymous, 2008).

Statistical analysis

Statistical Analysis System- SAS (2012) program was used to test the significance of treatment differences of studied parameters. Least significant difference -LSD test was used to compare between means significances in this research. Every analysis was performed in triplicates and mean values are expressed on a dry matter.

Table 1: Formula forbread making test

%BF	Ingredients (g)					
	WF	BF	Salt	Yeast	Water[1]	Improver[2]
%0	**000**	**0**	**00**	**10**	FWA	**0**
%0	**000**	**0**	**00**	**10**	FWA	**1**
%00	**000**	**00**	**00**	**10**	FWA	**1**
%00	**000**	**000**	**00**	**10**	FWA	**1**
%00	**000**	**000**	**00**	**10**	FWA	**1**
%00	**000**	**000**	**00**	**10**	FWA	**1**
%00	**000**	**000**	**00**	**10**	FWA	**1**
%00	**000**	**000**	**00**	**10**	FWA	**1**
%000	**0**	**000**	**00**	**10**	FWA	**0**
%000	**0**	**000**	**00**	**10**	FWA	**1**

(1) FWA = Farinograph water absorption. (2) Wheat flour (83.5%), ascorbic acid 4%, malt (10%) and alpha-amylase (2.5%).

All flours used in this experiment contained approximately 11% moisture (Table 2). This is about average for Iraqi flours.

3. Result and Discussion

The moisture content is important for bread-making. It influences the rate of dough hydration and thus rheological characteristics [21]. The maximal limit fixed by the Iraqi standard is 14 % [Is]. WF and BF were found to contain 12.8 and 10.7% respectively. The low moisture content observed for BF is justified because barley is generally milled without tempering process. The ash content explainthe amount of bran remaining in the flour after the milling.Barley flour contains 1.8% of ash significantly, higher than wheat flour 0.72%. The greater percentage of ash in barley flours could be due to a less complete separation of the bran and germ from the endosperm. Fat content in barley flour is 17.45%significantly higher than wheat flour which is 1.55%. Color values of the two barley fractions (BF 50gg and BF on tray), WWF1, TWF, IWF and Control wheat flour are showed in table 2. The color degree values showed that whole wheat flour and barley flourwas darker than imported and local wheat flour presented in local Iraqi markets. The particles size refers the fineness and homogeneity of the flour. The determination of this character is important because water absorption is higher in flour with a fine particles size than coarse flour, due to the surface area factor. As shown in table 2, barley flour was 30-39 mm significantly smaller than wheat flour which was 70 mm in average by the sieve of 10xx of diameter. While, particle size of the wheat flour range from 6-14 mm finer than barley flour which was 30 mm on 50xx.

Table 2: Physical and chemical analyzes of barley, imported (Turkish) and Local Iraqi wheat flours.

Samples	Moisture %	Ash %	Fat%	Color degree	particle size on 10xx	particle size on 50xx
WBF	11.6	2	**13.50**	14.4	40	30
BF 50gg	10.4	1.8	**15.60**	10.2	**39**	**00**
BF on tray	10.6	1.4	**17.45**	9.0	**30**	**00**
WWF 1 (Bakery flour, dark flour)	11.0	1.7	**1.50**	15.5	72	14
TWF on tray Turkey	11.2	0.79	**0.00**	4.3	71	10
IWF (Al-Bashaer mill) Iraq	14.0	0.72	**0.40**	4.2	72	8
Control	13.1	1.5	**0.00**	3.5	70	6
LSD value	2.885 *	0.662 *	4.31 *	3.97 *	11.65 *	5.02 *
CV %	15.88 %	12.05%	18.46%	12.73%	22.65%	18.53%

WBF=wheat barley flour, BF=barley flour, WWF=whole wheat flour, TWF=Turkish wheat flour, IWF=Iraqi wheat flour (Iraqi mill, Bashaer) and the control= standard white flour used for bread in Iraq.

Table 3 shows the fatty acid composition of the barley flour. Lauric, myristic, oleic and palmitic acids were the major fatty acids.

Table 3: Concentrations of fatty acids most frequently present in oil of the barley flour

Fatty acids	g/100g^{-1}oil
C_6Caproic acid	0.1970
C:$_8$Caprlic acid	3.6866
C_{10}Capric acid	3.8246
C_{12}lauric	51.8627
C_{14}Myristic	15.4580
C_{16}palmitic acid	7.9398
C_{18}Stearic	1.7437
$C_{18:1}$Oleic	11.4389
$C_{18:2}$Linoleic	1.5739
Fat (g/100g)	**%04.00**

Glutein contents

The percentage of gluten content of the different kind of flour (WBF, BF on 50gg, BF on tray, WWF1, TWF, IWF and control) is measured in table 4 to see the fade of sellers in the absence of healthysurveillance (monitoring) and consumer protection. It was found that the percentage of the gluten in the white barley flour zero, while it is bought in all Iraqi market as barley flour. The same thing with barley flour which runs on sieve 50gg and on tray, the percentage of the gluten was zero as shown clearly in table 4. In contrast of that, the highest of gluten percent was in the wheat flour imported from Turky 25 when compared with the control 24.2%. Gluten content decreased to 22.o% in each of the wheat flour which was found in the local markets and which was produced in the General Company for Cereal production in Iraq. As known, the yields of gluten fraction were closely correlated with protein contents of their flours (based on values in table 5.

Table 4: Gluten content (%) of different flour which used in Baghdad

Samples	%Gluten
WBF=White barley flour	No gluten network formation
BF 50gg= barley flour	No gluten network formation
BF on tray= barley flour on tray	No gluten network formation
WWF 1 (Bakery wheat flour) dark flour	22.0
TWF on tray (Turkey) wheat flour	25.0
IWF (Al-Bashaer mill) Iraq wheat flour	22.0
Control	24.2
LSD value	2.750 *
CV %	14.63%

Rheological properties of the dough

The farinograph data of the barley flour and different types of wheat flour that used in Iraqi local markets are summarized in table 5. Protein is an important criterion for bread-making, which is used to appreciate the end use of wheat. The protein content is strongly correlated to the quantity of gluten which is responsible for rheological characteristics and behavior of flour during baking (Aziz, and Mohammed 2013). Protein content of the barley flour ranged from 11.2 to 12.5% and ranged from 9.0 to 10.2% in different wheat flours which is significantly different compared with control. Moisture content also significantly different for all kinds of flours compared with control. Water absorption of the all kinds of barley flour dough ranged from 70.0 to 72.0% that was higher than the control 58.2%, and also was higher than all kinds of wheat flours that were ranged from 59.9 to 69.3% flours which are significantly different compared with control. The arrival time of the wheat's dough was the same with control 1.0 min., while the stability time of imported dough's flour from Turkey was longer 12.6 min than that of the control except for whole wheat WWF1 and Iraqi wheat flour IWF which are smaller than control 5.5 and 5.5 min respectively. In contrast of that, dough made from barley flour could not develop and there weren't arrival times and dough stability, due to the absence of the gluten content which is important to make the dough structure and the gluten network as shown clearly in table 4.The defects observed in dough's flour mixtures are mainly due to the weakness and no elasticity of barley gluten. This depreciation is perceptible starting at 40% barley flour incorporation.

Table 5: Rheological properties of the dough from different sources of wheat, barley flour & its fractions used in Baghdad city

Samples	Protein %	Moisture %	Water absorption %	Arrival time (min)	Dough development time (min)	Dough stability time (min)
WBF	10.2	11.6	72	-	-	-
BF 50gg	11.5	10.4	71.5	-	-	-
BF on tray	12.5	10.6	70.0	-	-	-
WWF 1 (Bakery flour) dark flour	9.0	11.0	69.3	1.2	5.7	5.3
TWF on tray, Turkey	10.2	11.2	60.4	1.1	2.4	12.6
IWF (Al-Bashaer mill) Iraq	9.7	14.0	59.9	1.3	2.0	5.5
Control	10.5	13.1	58.2	1.0	1.8	7.2
LSD value	2.06 *	2.28 *	6.84 *	0.42 NS	1.75 *	3.64 *
CV %	12.78%	16.35 %	19.07 %	11.02%	13.49%	11.85%

Values with the same letters in the same column are not significantly different. Control=100% WF, BF 50gg=Barley flour on sieve 50gg, WWF1= Whole wheat flour, WFT= Imported Turkish wheat flour, IWF= Iraqi wheat flour from Al-Bashaer mill.

Rheological properties of the plain and composite dough:

The farinograph data of the plain and composite flours are summarized in table 6. There were no significance differences in moisture contents in different composite flour with barley flour or with wheat or barley flour. Gluten content in wheat flour is the highest 24.2%, while it was zero content of gluten in barley flour as presented in table 6. Gluten content decreased significantly as the level of replacement increased. Water absorption of the composite flour dough ranged from 68.3 to 74.7% with sample of 10% and 60% barley flour subsistution and was significantly higher than the control 63.4%. The high percent of water absorption during mixing is a typical property of composite starches (Doxastakis et al. 2002). Also, Lee et al. (2001) and Morita et al. (2002) presented that the dough of the composite flours absorbed more water than wheat flour only. Development time is the time from the first addition of the water to the time the dough reached the point of greatest torque (Malomo, et al. 2006). During this phase of mixing, the water hydrates the flour components and the dough is developed. There were significant differences in development

time between the dough with or without substitution. Dough development times of the composite flours were not substantially altered by adding of up to 20% barley flour. However, both peak height and area decreased significantly by addition up to 60% barley flour to wheat flour due to the some extensibility of barley proteins.The defects observed in dough's flour mixtures are mainly due to the weakness and no elasticity of barley gluten. This depreciation is perceptible starting at 40 % barley flour incorporation. The characteristics of bread baked from composite flour (wheat and barley) confirmed data obtained with mixograph. Higher levels of barley flour dilute wheat gluten and impairment of its gas retention capacity. An earlier study (Aziz and Mohammed 2013, Malomo, et al. 2006) also presented acceptable bread produced from 10-50% wheat-barley composite flour.

Table 6: Formula of Farinograph parameter of wheat (WF), barley (BF) and composite flours (10, 20, 30, 40 and 60% of barley flour with wheat flour)

%Ingredient		Farinograph parameter					
BF	WF	%Moisture	Gluten %	%Absorption on 14% moisture	Development time (min)	Stability (min.)	Degree of softtening (FU)
0 BF%	000	00.0	00.0	00.0	3.0	6.7	00
BF%00	30	00.0	00..	0.. 0	0.4	6.1	0
BF%00	.0	00.0	03.0	00.4	0.0	6.9	00
BF%00	40	00.0	00.3	40.0	4.0	7.6	00
BF%00	00	00.0	00.0	40.0	3.0	10.5	00
BF%00	00	~~??.0~~	~~??.?~~	~~??.?~~	~~??.?~~	11.2	00
%00	00	11.6	9.7	74.7	19.0	12.2	00
%000	0	10.2	0.0	79.2	4.5	9.5	0
LSD value	--	3.05 NS	5.92 *	4.76 *	4.15 %	2.66 *	5.83 %
CV %	--	12.46%	11.95%	16.74 %	12.06 %	12.7%9	17.35%

Mixer: 300 g, speed: 63/1 min, Consistency 516 FU with water absorption 66.3%, water absorption (corrected for 500FU):66.7

Physical properties of composite bread:

The loaf volume of the composite bread ranged from 255 to 455 cm^3 with 10 to 60% barley flour substitution. It was clearly showed that as the level of substitution increases, the loaf volume decreases significantly compared with wheat flour only 460 cm^3 table 7. The loaf weight of the composite bread samples ranged from 120.0 to 139.5 g as shown in table 7 with 10 to 60% barley flour addition significantly different from wheat flour only as control. The specific volume of the composite bread samples decreased significantly with the addition of barley flour and ranged from 2.1 to 3.3 cm^3/g with 10 to 60% of barley flour additions compared with control. This is in accordance with the report of Aziz and Mohammed (2013) and Trogh, et al. (2004).

Table 7: Quality evaluation for wheat, barley and composite flour with barley breads

Flour kind	%Barley Supstitution	Loaf volume (cm)	Loaf weight (gm)	Specific volume (cm^3/gm)
Wheat flour	0	460	000.0	0.0
Barley flour	100	250	000.0	0.4
Composite flours	10	455	003.0	0.0
	20	422	000.0	0.0
	30	395	000.0	0.0
	40	356	000..	0..
	50	310	000.0	0.0
	60	255	000.0	0.0
LSD value	12.59 *	36.93 *	19.52	0.883 *
CV %	15.85	22.61	21.04	12.57

Sensory properties of composite bread:

Sensory evaluation of composite bread (loaf) was undertaken and most acceptable in term of volume, crust and crumb color, regularity grilling, break and shred and surface smoothing was taken and used as control as in table 8. It was clearly found that that all the characteristics of bread baked from composite flours with barley confirmed data obtained with farinograph and mixograph. Not more than 10% barley flour could be added to wheat flour without seriously affecting the overall characteristics. Higher levels of barley flour brings the bread to be unacceptable quality, but it consumed for its beneficial effects in terms of improving the nutritional status of the consumers since bread consumption is very high in Iraq.

Table 8: Sensory evaluation of laboratory bread quality (processed from wheat and composite from wheat & barley flour)

Characters	Grade range	Wheat Flour (%100)	Composite flours with barley flour%					
			00	**00**	**00**	**00**	**00**	**00**
Exterior appearance								
Volume	1-10	**00.0**	**3.0**	**. .0**	8.0	**0.0**	**0.0**	**0.0**
Crust color	1-8	**4.0**	**0.3**	**0.0**	**0.0**	**0.0**	**0.4**	**0.0**
Regularity Grilling	1-3	**0.0**	**0..**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
Break & shred	1-3	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.4**	**0.0**
Smoothing the surface	1-3	**0..**	**0..**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**
Regularity	1-3	**0.0**	**0.3**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**
Interior appearance								
Crump granulation	1-10	**3.0**	**. .4**	**. .0**	**4.0**	**0.0**	**0.0**	**0.0**
Crump color	1-10	**3.0**	**3**	**4.3**	**4.0**	**0.0**	**0.3**	**0.0**
Texture tenderness	1-15	**00.0**	**00.0**	**00.0**	**00.0**	**3.0**	**3.0**	**4.0**
Flavor	1-15	**00.0**	**00.0**	**00.0**	**00.0**	**00.0**	**. .0**	**. .0**
Taste	1-20	**03.0**	**0.. 0**	**04.0**	**00.0**	**00.0**	**00.0**	**00.0**
Total	**000**	**30..**	**... 0**	**.0. 0**	**40.0**	**00.0**	**00.0**	**00..**
LSD value	--	3 .29 *	3.73 *	2.52*	5.43*	3.44*	3.07*	2.62*
CV %	--	12.94%	15.87%	18.02%	14.38%	14.09%	13.78%	16.32%

All data are the average of 10 specific panelist's evaluation

4. Conclusion

The use of barley bread begins to grow especially in modern bakeries installed in the center of Baghdad and other bigger states in Iraq. Barley flour was found to contain high percent of protein, ash and fat, also a reasonable amount of oleic unsaturated fatty acid instead of other saturated fatty acid which was very important for human health. Increasing the level of barley flour supplementation to 40-60% affects the sensory characteristics (color, thickness and volume) of bread significantly. While, bread made from 10-40% of barley flour supplementation was found acceptable in all quality properties. However, the overall quality of bread remains more acceptable till 60% of barley flour addition for consumers who are aware about their health and nutrition. Other finding in this study was declarethat all barleys breads that bought in all local market as barley bread is fade. The0ther important objective of this study was Verification and search for the truth, that's barley bread with higher volume and excellent texture that's sold in local markets by checking the chemical analysis of barley flour and compared with wheat flour. It was found that barley flour milled from barley flour did not have any gluten, while the percent of gluten in fade barley flour was 25.0, that's means is not barley flour theoretically and just specialist person knotweed. Instead of that, the Insisting and investigate the source of the fake barley flour, it was found that flour is sold as wheat flour which imported from Turkey as shown clearly in the picture below. But, cheating bakers make it as barley bread, and also Consumer ignorance about any nutritional information on barley flourled to increased use of this type of flour fake on consumer health account. So it will be announced through the satellite TV channels for deceiving bakers and warn consumers, especially diabetics and obese persons to quit consuming that kind of bread because it will adversely affect their health and obesity.

5. Acknowledgements

This work was conducted at General Company for Grain Processing / Quality Control / Ministry of Commercial. For their contribution with all chemical, physical and sensory analysis. Also, authors are thankful to the bakery staff and to the professional bakers who have performed the sensory evaluation of the produced bread.

References

[1] American Association of Cereal Chemistry, 1969.Approved methods of the AACC. Method 10-10, approved April 1961; Method 14-30 approved October 1974. The Association: St. Paul, MN.-
[2] A.A.C.C. (1984).Approved Methods of American Association of Cereal Chemists. St. Poul. MN.
[3] A.A.C.C. (2000).American Association of Cereal Chemistry. Approved Methods of AACC (10th ed.), St Paul,Minnesota.
[4] Anonymous, (2008).Bread World Record (in Germany).www.bivrhenland. De/Brotweltrekord/BWR-WDR-TV 140905.
[5] A.O.A.C. (1990).Association of Official Analytical Chemists 15th ed. of Anayt. Chem. Washington D.C.: Association of Official Analytical Chemist.
[6] Aziz, E. and Mohammed, O. (2013).Utilization of barley *(Hordeumvulgare L.)* flour with common wheat. Annals of Biological Research, Vol.4(2):119-129.
[7] Bhatty, R. S. (1968). Physicochemical and functional (bread making) properties of hull-less barley fractions. Cereal Chemistry. 63:31-35.
[8] Bhatty, R.S. (1999).*Cereal Chemistry* 1999, 76(5): 589-599.
[9] Behall KM, Scholfield DJ, Hallfrisch JG.(2002). Fasting glucose and insulin and measures of insulin resistance of men after consumption of whole wheat/brown rice or barley. (Abstract). J Am CollNutr 21:486.
[10] Behall KM, Scholfield DJ, Hallfrisch J. (2004). Lipids significantly reduced by diets containing barley in moderately hypercholesterolemic men. J Am CollNutr. 23(1):55-62. 2004

[11] Bjorck, H. Lilijeberg and E. Ostman, *British Journal of Nutrition.*1999, 83 (Supplement 1):149-155.
[12] Doxastakis, G., Zafiriadis, I., Iraklim, Marlani, H. and Tananaki, C. (2002).Lupin, soy and triticale addition on wheat flour doughs and their effect on rheological properties. Food Cem. 77:219-227. Doi:10.1016/S0308-8146(01)00362-4.
[13] FAO. (1982). Production year book, Roma . Italy. –13-Gary, G. and Veronica, J. Developing barley-fortified wheat based foods. Wheat Marketing Center, Portland, Oregon, USA. P: 1-11.
[14] IS Iraqi Standard, Dried Food Products, Wheat products wheat flour for bread industry.37/1988:2-7.
[15] IUPAC, 2.301, 2.302, (1979). FAO Manuals of Food Quality Control 14/8, pages 274-281/A.O.A.C. 17thed, 2000 Official Method 969.33 and 969.22 Fatty acids in oils and fats preparation of methyl estes/ Gas Chromatographic method.
[16] Joseph, M.; Melanie, G.; Tatyana, S.; Nathan, K.; Lore, K. and Leslie, C. (2007).The effects of concentrated barley β-glucan on blood lipids in a population of hypercholesterolaemic men and women. British J.Nutr.p:1-7.
[17] Makarim, A., Inas, M., Ibraheem, K. and Tamather, H. (2012).Adding wheat germ on bread and sensory properties study. J. Food Industries &Nutr. Sci., 2(1):23-30.
[18] Malomo, S.; Eleyinmi, A. and Fashakin, J. (2011).Chemical composition, rheological properties and bread making potentials of composite flours from breadfruit, breadnut and wheat. African J. Food Sci. Vol. 5(7):400-410.
[19] Mishra, A. R. Mishra, D. K. Pradhan, S. Jha, R. Chandra, K. Meena, B. C. Nandy, L. Makode, *Der Pharmacia Lettre*, 2010, 2(5): 371-378.
[20] Pyler, E. J. (1988).Baking Science and Technology, 3rd Ed. 1 and 11.Sosland Publishing Company. USA, P. 345.
[21] Sabeha, H. Al-Jobory.(2010). Effect of addition barley flour on rheological properties of wheat flour. J. Sci.Tikriet Univ. Vol. 11(3):25-35.
[22] SAS. 2012. Statistical Analysis System, User's Guide. Statistical.Version 9.1th ed. SAS.Inst. Inc. Cary.N.C. USA.
[23] Trogh, C.; Anderson, A., Aman, P.; Serensen, J. and Delcour, J. (2004). The combined use of hull-less barley flour xylanase as strategy for wheat hull-less flour eads with increased arabinoxylan and (1-3, 1-4)b-d glucan levels. J. Cereal Sci. P.O. Box 7051, Se-75007 uppsala, Sweden.