__Original Research Article__

Influence of Addition of Naked Barley and Broken Rice on Chemical, Rheological and Organoleptic Properties of Balady Bread

ABSTRACT

The study discusses the influence of blending naked barley flour (NBF) and rice flour (RF) on balady bread preparing from refined wheat flour (WF). The chemical composition of NBF, RF and WF were investigated. Not only-but also, NBF had high protein, lipid, fiber, ash, and carbohydrate contents 12.60, 02.66, 2.83, 1.95 and 79.93%, respectively. Different proportions of NBF (5, 10, 15 and 20%) and RF (ratio fixed 5% for all blends) was replaced with WF comparison with control sample WF (100%) were blended to make balady bread. Addition of NBF and RF in comparison to WF lead to slight increase in rheology properties (water absorption, dough development, and stability). Nonetheless, degree of softening, arrival time elasticity, extensibility, proportional number and energy value decrease compared to the values with dough WF. Along with, the chemical characteristics of all blends balady bread such as protein, fat and fiber were decreased but the B5 producing from (20%NBF, 5%RF and 75%WF) were increased significantly in protein, fat and ash compared with control. Balady bread prepared using NBF and RF exhibited high crude protein, fat, and fiber with improved minerals contents like Ca, K, and Mg.

Furthermore, organoleptic properties results indicated that partially replacing of WF 82% extraction by 20% NBF, and 5% RF still providing a good quality of functional Egyptian balady bread used the NBF and RF in balady bread producing improved the nutritional and some of the physical properties of balady bread. Apart from this, all produced balady bread was fresh and suitable for human consumption,

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particularly up to 15 % NBF substitution. Therefore NBF and RF could be used to improve the nutritional and some physical characteristics of balady bread.

Keywords: Rice, Naked barley, balady bread, chemical composition, minerals, rheological, Sensory attributes.

1.INTRODUCTION

Bread is one of the most important staple foods consumed all over the world, Bread wheat is an Egyptian product that represents the main source of carbohydrate and the main diet component for rich and poor Egyptian consumers [1].

Litwinek et al. [2] stated that the total production of wheat grains covers only about 50% of the total Egyptian needs; therefore, the total yield does not satisfy the requirements of the country. For centuries, wheat has been the central component of the typical diet of the country's inhabitants, so percapita consumption of this cereal is amongst the highest in the world as stated by FAO [3], Egypt is not only the largest importer of wheat but also the largest wheat consumer and bread eater per capita in the world because the heavy dependency on wheat, according to a report issued by the CAPMAS [4] for consumption in 2015, the average consumption per capita of wheat reached 141.1 kg in 2015 versus 133.6 kg in 2014.Therefore, searching for other cereal sources, which could be integrated in making wheat flour bread is needed to overcome the wheat gap and satisfy consumers' needs [2]. In addition, this would reduce the dependency on wheat imports and increase livelihoods of local farmers who produce crops that may be applied in flour composites [5].

The primary dietary sources of carbohydrates for human nutrition are cereals. Wheat, rice, maize, barley, and sorghum are the top five cereal species that are farmed worldwide. The relevance of other species such as millets, rye, and oats is negligible or local [6]. The fact that the majority of the world's food security depends on cereal

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production, which totals over 2600 million tonnes annually, serves as more evidence of the importance of cereals and cereal products FAO [7].

Human use of cereals dates back a long time. In both developed and developing countries, cereals are key sources of nutrients and staple foods. Cereals and cereal products contain a variety of micronutrients, including vitamin E, several B vitamins, magnesium, and zinc, and are an essential source of energy, carbohydrate, protein, and fiber. Cereals also add a considerable quantity of calcium and iron to diets in the UK due to the mandated fortification of some cereal products (such as white flour, which results in white bread), and the voluntary fortification of other products (such as breakfast cereals). Due to the required fortification of some cereal products (like white flour, which produces white bread), as well as the voluntary fortification of other products (like breakfast cereals), cereals also significantly increase the amount of calcium and iron in diets in the UK [8].

The majority of the world's energy and nutrition come from cereal grains [9]. The ancient grain known as barley (*Hordeum vulgare* L.) has long been used for animal feed and as a primary ingredient in the manufacture of malt [10]. Extensive research and epidemiological studies on the advantages of cereals for human health have connected whole grain consumption to the prevention of metabolic syndrome, obesity, and related chronic diseases like cardiovascular disease and two forms of diabetes. Cereals' phytochemicals, such as phenolic acids, flavonoids, vitamins, fibre, and minerals, work together to fight oxidative stress, inflammation, hyperglycemia, and carcinogenesis, and are principally responsible for the health benefits of cereals [11]. In order to produce functional barley flours that may be easily absorbed into foods and satisfy the authorised health claims of β-glucan, it is intriguing to employ hullless barley types with high quantities of β-glucans. Because barley flour contains

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more soluble fibre than wheat flour, it often has a higher capacity to absorb water, which can enhance baking qualities [12].

Today, barley (*Hordeum vulgare* L.) is unfairly disregarded as a food crop. Recently, there has been a rise in curiosity about the use of barley in the food industry. This is because it contains dietary fiber, particularly β-glucan, which has been demonstrated to lower blood sugar and cholesterol levels. Starch, sugar, proteins, fat, and ash are the primary nutritional components of barley and barley products in addition to the β-glucan stated before. Barley can be used to produce similar items, even though it is not frequently done in the production of pastries, and because it has better nutritious and palatable sensory properties, these products are attractive [13]. One of the first cereals to be recognized as a source of essential nutrients and energy for sustaining bodily processes and health is barley. Only 2% of the world's current barley crop is grown for food, although it is still a staple cereal in some countries with harsh climates, including those in Asia, the Himalayan countries, and North Africa [14].However, barley flour demonstrated much better values than refined wheat flour for nutritional parameters like dietary fibre, resistant starch, and total antioxidant activity. Compared to refined wheat flour, barley flour has a better nutritional value overall [15].

Especially β-glucans and other useful components, naked barley is a great source of dietary fiber and non-starch polysaccharides. Consequently, there is an increasing interest in using naked barley in items to improve their nutritional content. Barley's poor baking qualities make it unpopular for baked items. Reduced bread loaf volume, storage time, and consumer acceptance are caused by a high barley content [16]. Besides, its high nutritional value, particularly due to the dietary fibre it contains and the presence of non-starch polysaccharides, barley is becoming more popular.

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Barley without the hulls is a good source of soluble and insoluble dietary fibre, which contains useful non-starch polysaccharides, particularly β-glucans [17]. Not only-but also, consumers approved of the balady bread and biscuit's organoleptic qualities, which were produced from barley/wheat blends with a replacement level of 45%. When kept at room temperature, barley balady bread shown greater freshness retention [18].

Apart from this, their high content of easily digested carbohydrates and gluten-free nature, rice (*Oryza sativa*) and maize (*Zea mays*) flour is used in the production of gluten-free foods. The second most common cereal produced worldwide is rice The byproduct of milling rice, broken rice is sold for less money [19].

The protein derived from rice, one of the major food crops in the world, is wholesome, hypoallergenic, and appropriate for use in baby food formulations and other nutraceutical foods. One of the main byproducts of milling, broken rice, has 8% protein and contains essential amino acids [20].

Egypt's rice losses ranged from 8.16 to 28.50%, and the percentage of breakage rose with a longer storage duration. Furthermore, moisture content of the rice grain was another vital factor in increasing the breakage **(**[21]. Additionally, considering the low commercial value of some rice products, like chalky or broken grains, could be significantly improved if their functionality is suitable for food manufacture [19,22] .

The purpose of the present investigation was to study the influence of partial substitution of NBF and RC with WF on the dough parameters and balady producing, and determined of its chemical analyze, balady bread quality, sensorial and physical properties.

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2.MATERIALS AND METHODS

2.1MATERIALS

Wheat flour (82% extraction) was purchased from the North Cairo Flour Mills Company, Egypt. Broken rice flour (*Oryza sativa*) were bought from the local market, Egypt. Naked barley (*Hordeum vulgare* variety Giza l30) was obtained from Barley Research Department, Field Research Institute, Agric. Res. Center, Giza, Egypt.

2.2.Preparation of balady bread

Different blends (Table 1) were mixed at the rate of 100 g blended flour with 0.5 g active dry yeast, 1.5 g sodium chloride, and water (according to farinograph parameters) for about 6 min till forming consistent dough. The dough was left to ferment (1 h/30ºC/85% relative humidity), then divided to pieces (125 g). The pieces were arranged on a wooden board that had been sprinkled with a fine layer of bran and were left to ferment for about 45 min at the same temperature and relative humidity. The pieces of fermented dough were flattened to be about 20 cm in diameter. The flattened loaves were proofed at 30–35ºC and 85% relative humidity for 15 min and then were baked at 400–500ºC for 1–2 min. The loaves of bread were allowed to cool on racks for about 1 h before evaluation [23].

Table1. Balady bread preparation.

Constituents	Control	Blend1	Blend2	Blend3	Blend4
WF (72%)	100	90	85	80	75
NBF (%)	0	5	10	15	20
RF (%)	0	5	5	5	5
Salt (g)	2	2	2	2	2
Yeast (g)	1	1	1	1	1

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WF= Wheat flour NBF=Naked Barley Flour RF=Rice Flour

2.3.Proximate Chemical analyzes

Crude lipids, crude protein, fiber, and ash were estimated as proximate chemical parameters using AOAC [24]. Carbohydrates were measured by subtracting the difference from initial weight of the samples as follows:

% Carbohydrates = 100 – (crude fat + ash + crude protein + crude fiber)

Calorie values were determined in accordance with the Atwater method FAO [25].

Calorie value (kcal/100g) = (% carbohydrate × 4.1) + (% protein×4.1) + (% fat× 9.1).

2.4.Determination of Minerals

In accordance with the US EPA, (1994) [26] minerals were assessed in ash solution using ICP-OES Agilent 5100 VDV.

2.5.Rheological properties

The various blends' rheological possessions were assessed using the Brabender Farinograph and Extensograph apparatus in accordance with AOAC (2012) [24].

2.6.Determination of Water activity (a_w)

Water activity (aw) was measured at 25°C using a Decagon A qualab Meter Series 3TE (Pullman, WA, USA). All samples of storage balady bread were broken into small pieces immediately before water activity measurement [27].

2.7.Sensory evaluation

25 panellists from the staff of the Sakha Food Technology Research Laboratory, Agriculture Research Centre Egypt was asked for sensory possessions of balady bread according to El-Farra *et al*. [28]. Each blend was assessed for its general appearance (20), layers separation (20), roundness (15), crumb distribution (15), crust color (10), taste (10), and odor (10).

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2.8.Statistical Analysis

SPSS software (version 26) was employed for the statistical analysis, and Duncan's multiple range tests were employed for mean comparison. To compare between means, Duncan's multiple range tests were performed at the (P≤ 0.05) level

3.RESULTS AND DISCUSSIONS

3.1Chemical composition for raw materials (% on dry weight basis):

Table 2 summarizes the findings of the chemical analysis of the raw materials, exposed that wheat flour 82%extraction contained 1.13 % ash; 11.76% crude protein; 1.84% lipid; 1.71% crude fiber; 83.54 % carbohydrates; and the caloric value (407.51kcal/100g). These results differ with El-Hadidy and Rizk (2020) [29]reported that wheat flour comprises 10.70% crude protein; 1.20% lipid; 1.04% ash; 1.16%crude fiber and 87.06% carbohydrates. Also, the previous findings indicated that wheat flour comprise 1.80% fat; 1.47% ash; 1.5% crude fiber; and 84.13% carbohydrates El-Hadidy and El-Dreny, (2020) [30].

As for naked barley flour, findings presented 12.62% crude protein; 2.66%lipid; 1.95% ash; 2.83% crude fiber; 79.93% carbohydrates and the caloric values (404.41kcal/100g). The data were in harmony with the reported work El-Hadidy et al., (2020) [31] showed that naked barley flour had 2.54% crude fiber; 1.30% ash; 10.92% proteins; 85.18% carbohydrates; and the caloric value (407.80 kcal/100g).

The findings of rice flour analysis showed 7.75%crude protein; 0.61%lipid; 0.35% crude fiber; 0.88% ash; and 90.38% carbohydrates; and the caloric value was (407.96 kcal/100g). The data are in harmony with the work of El-Dreny and El-

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Hadidy (2020) [20] who stated that rice flour had 0.67%crude lipid; 07.95%crude protein; 90.13% carbohydrates; and 0.93%ash.

Table 2:Chemical composition for raw materials (% on dry weight basis):

Treatments	Chemical composition					
	Protein%	Lipid%	Ash%	Fiber%	*Carbohydrates%	Energy Value (Kcal.)
Wheat flour	11.76 [b] ±0.04	1.84 [b] ±0.03	1.13 [b] ±0.01	1.71 [b] ±0.01	83.54 [b] ±0.06	407.51 [a] ±0.01
Naked barley flour	12.62 [a] ±0.03	2.66 [a] ±0.05	1.95 [a] ±0.03	2.83 [a] ±0.03	79.93 [c] ±0.08	404.41 [b] ±0.07
Rice flour	7.75 [c] ±0.04	0.61 [c] ±0.01	0.88 [c] ±0.02	0.35 [c] ±0.01	90.38 [a] ±0.03	407.96 [a] ±0.02

-Means with different letter in the same row are significantly different at *($p \leq 0.05$)*.
- Each value was an average of three determinations ± there are a difference between Average and standard deviation.
*Carbohydrates% = 100 – (crude fat + ash + crude protein + crude fiber)

3.2.Proximate composition of raw materials

Table 3 showed that chemical composition of minerals for raw materials and comprehension between wheat, naked barley and rice flour. In order to study in Table 3 showed that mineral contents of raw materials (wheat, naked barley and rice flour) observed the most minerals such as magnesium were found to (150.50, 160.22 and 143.18 mg /100g) and calcium were found to (18.74, 22.91 and 17.30 mg /100g) as a macro elements, iron were found to (2.38, 2.44 and 1.83 mg /100g) and copper were found to (0.32, 0.76 and 0.52 mg /100g) as a micro elements, respectively. Regarding of raw materials, the results indicate that the raw materials (wheat, naked barley and rice flour) contains amounts of potassium were found to (148.20, 157.31 and 375.80 mg /100g), sodium were found to (4.90, 3.64 and 6.98 mg /100g) and phosphorus were found to (190.85, 186.87 and 72.01 mg /100g) as a macro elements and zinc were found to (4.28, 2.15 and 0.94 mg /100g), and manganese were found to (2.06,

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1.44 and 2.31 mg /100g) as a micro elements, respectively. The data were in harmony with the reported work [19,20].

Table3. Chemical composition of minerals for raw materials (mg/100g):

Minerals	Raw materials		
	Wheat flour	Naked barley flour	Rice flour
Ca	18.74^{b} ±0.02	22.91^{a} ±0.01	17.30^{c} ±0.02
Mg	150.50^{b} ±0.01	160.22^{a} ±0.03	143.18^{c} ±0.02
Na	4.90^{b} ±0.01	3.64^{c} ±0.01	6.98^{a} ±0.01
K	148.20^{c} ±0.01	157.31^{b} ±0.02	375.80^{a} ±0.02
P	190.85± 0.02^{a}	186.87^{b} ±0.02	72.01^{c} ±0.02
Mn	2.06^{b} ±0.01	1.44^{c} ±0.02	2.31^{a} ±0.02
Cu	0.32^{c} ±0.01	0.76^{a} ±0.01	0.52^{b} ±0.02
Zn	4.28^{a} ±0.03	2.15^{b} ±0.01	0.94^{c} ±0.02
Fe	2.38^{b} ±0.01	2.44^{a} ±0.02	1.83^{c} ±0.01

-Means with different letter in the same row are significantly different at ($p \leq 0.05$).
- Each value was an average of three determinations ± there are a difference between Average and standard deviation.

3.3.Proximate composition of balady bread

Table 4 shows the chemical composition of balady bread prepared from blends containing NBF, RF, and WF. The proximate composition of blends balady bread were significantly affected by blending with various NBF and RF, ratios. The protein content of balady bread was significantly lower after blending with various NBF and RF ratios (compared to control, 11.76%). The protein content of balady bread was raised to 11.58 to 11.72 (g/100g), respectively, by replacing NBF and RF with WF. Balady bread's fat content was significantly higher after blending with various NBF and RF ratios compared to the control 1.84 (g/100g). The ratio of fat was raised to 1.82 and 1.87 (g/100g), respectively, by replacing NBF and RF with WF. In comparison to the control level of 1.13%, the ash content of pan bread was

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dramatically enhanced when NBF and RF were replaced with WF. Substituting with different Extents of NBF and RF significantly (P ≤ 0.05) reduced the carbohydrate content of balady bread in comparison to control (83.54%). Replacing NBF and RF with WF reduced the carbohydrate content to 83.78–83.26% respectively.

Blending with different proportions of NBF and RF significantly (P ≤ 0.05) increased the energy content of balady bread in comparison to control (407.51%). Blending NBF, RF with WF increases the energy content to 407.66–414.37 kcal respectively. Blending with NBF and RF significantly increased the energy content of blends B2 and B4 as the NBF proportion increased. The found results approved with those stated by [32].

Table 4: Chemical composition for different treatments balady bread:

Treatments	Chemical composition					
	Protein%	Lipid%	Ash%	Fiber%	Carbohydrates%	Energy Value (Kcal.)
B1	11.76 [a] ±0.04	1.84 [a] ±0.03	1.13 [d] ±0.01	1.71 [cd] ±0.01	83.54 [c] ±0.06	407.51 [b] ±0.01
B2	11.58 [c] ±0.03	1.82 [a] ±0.04	1.15 [d] ±0.01	1.64 [d] ±0.04	83.78 [b] ±0.04	407.66 [b] ±0.04
B3	11.63 [bc] ±0.03	1.87 [a] ±0.05	1.20 [c] ±0.01	1.75 [bc] ±0.01	83.54 [c] ±0.07	407.23 [bc] ±0.02
B4	11.67 [abc] ±0.03	1.89 [a] ±0.03	1.24 [b] ±0.01	1.81 [ab] ±0.02	85.19 [a] ±0.04	414.37 [a] ±0.02
B5	11.72 [ab] ±0.03	1.87 [a] ±0.03	1.28 [a] ±0.01	1.86 [a] ±0.02	83.26 [d] ±0.03	406.47 [c] ±0.02

-Means with different letter in the same row are significantly different at *($p \le 0.05$)*.
- Each value was an average of three determinations ± there are a difference between Average and standard deviation.

3.4.Chemical composition of minerals for treatments balady bread:

The mineral composition of balady bread produced from blends containing NBF and RF and WF are presented in Table 5. Blending with different proportions of NBF and RF had a significant effect on the mineral composition of blended balady bread. Blending with different extents of NBF and RF significantly increased the K, Ca, Mg, and Cu content of balady bread in comparison to control .Replacement of

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NBF, RF with WF increased the K content of balady bread to (160.02–161.39mg/100g) respectively. On the contrary, Blending with different proportions of NBF significantly (P ≤ 0.05) decreased the Na, P, Mn, Zn, and Fe content of balady bread in comparison to the control. The found results approved with those stated by [32].

Table 5. Chemical composition of minerals for treatments balady bread:

Minerals	Treatments				
	B1	B2	B3	B4	B5
Ca	18.74 [e] ±0.02	18.87 [d] ±0.02	19.08 [c] ±0.02	19.29 [b] ±0.02	19.50 [a] ±0.02
Mg	150.50 [e] ±0.01	150.61 [d] ±0.01	151.09 [c] ±0.02	151.58 [b] ±0.02	152.07 [a] ±0.01
Na	4.90 [ab] ±0.01	4.93 [a] ±0.01	4.87 [b] ±0.01	4.81 [c] ±0.01	4.75 [d] ±0.01
K	148.20 [e] ±0.01	160.02 [d] ±0.02	160.48 [c] ±0.02	160.93 [b] ±0.02	161.39 [a] ±0.02
P	190.85 [a] ±0.02	184.70 [b] ±0.02	184.50 [c] ±0.02	184.30 [d] ±0.02	184.10 [e] ±0.01
Mn	2.06 [a] ±0.01	2.03 [a] ±0.01	2.00 [b] ±0.01	1.97 [c] ±0.01	1.94 [c] ±0.01
Cu	0.32 [c] ±0.01	0.34 [c] ±0.01	0.36 [bc] ±0.01	0.39 [ab] ±0.01	0.41 [a] ±0.01
Zn	4.28 [a] ±0.03	4.00 [b] ±0.02	3.89 [c] ±0.02	3.78 [d] ±0.02	3.68 [e] ±0.02
Fe	2.38 [a] ±0.01	2.33 [a] ±0.01	2.35 [a] ±0.01	2.36 [a] ±0.01	2.37 [a] ±0.01

-Means with different letter in the same row are significantly different at *($p \leq 0.05$)*.
- Each value was an average of three determinations ± there are a difference between Average and standard deviation.

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3.5.Rheological characteristics of balady bread dough

The farinograph and extensograph parameters of WF and its blends with NBF and RF are obtainable in Fig. 1. From the obtained data, it could be observed that the water absorption of WF gradually increased as the level of substitution with NBF and RC increased. The high fiber levels of NBF and RF than WF may be the cause of the WF dough's increased water absorption. These results are in harmony with El-Hadidy and Dreny [30] revealed that increasing the amount of fiber sources added to WF resulted in the produced dough absorbing more water. This may be due to fiber's high water hydration capacity Chen et al. [33]. The dough development time is the interval between adding water and when the dough reaches its maximum torque. The water hydrates the components of the flour during this mixing period, and the dough develops. The farinograph results revealed that adding NBF lengthened the time needed for dough to develop; this could be because the presence of the aforementioned plant sources delayed the hydration and development of gluten. Dough stability time is an important index for the dough strength based on the quantity and quality of dough gluten, so it could be noticed that, the stability time of the control was 9.00 min, which increased by adding NBF to pan bread reached about 9, 09.50,9.50,10.50, and10.50 min for B1, B2, B3,B4 and B5 respectively.

Regarding the extensograph parameters, the values offered in the Fig. 2 display that the resistance to extension of blends significantly decreased the elasticity of balady bread to (290–260 B.U) respectively in comparison to control (300B.U). Replacement of WF with NBF and RF decreased the extensibility from 100 to 85 B.U, respectively compared to the control (105 B.U). Also, substituting with different extents of NBF and RF significantly ($P \leq 0.05$) decrease the proportional number dough of balady bread in comparison to control 3.00. Substituting of WF with NBF and RF decreased the proportional number to 2.80–2.30 respectively. Supplementing with different extents of NBF and RF significantly reduced the energy dough of balady bread in comparison to control (40 cm). Supplementing of NBF and RF with WF reduced the energy dough of balady bread to 35–20, respectively.

According to Bojanská, et al., [34], the process of dough creation, from the first addition of water to flour up to the formation of compact dough with required properties (consistency, resistance to deformation, stability), it changes through

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several stages during which fluidity, firmness, and elasticity gradually change. The amount of time required for dough to form is influenced by the amount and quality of gluten, the size of the flour particles, and the degree of milling. Dough stability is the amount of time required for dough to maintain its maximum consistency, and high dough stability is considered to be a good quality from the perspective of future baking use [34,35].

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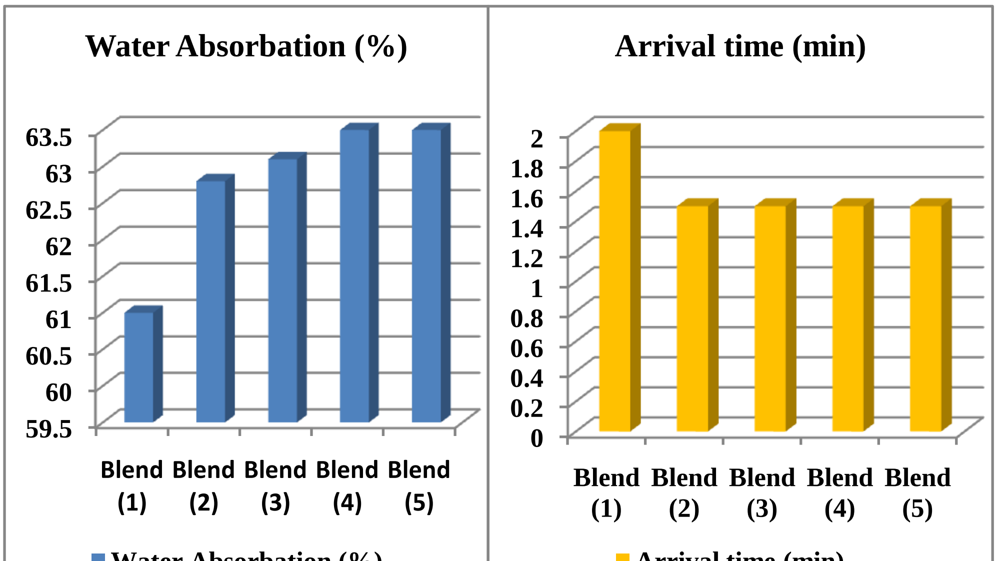


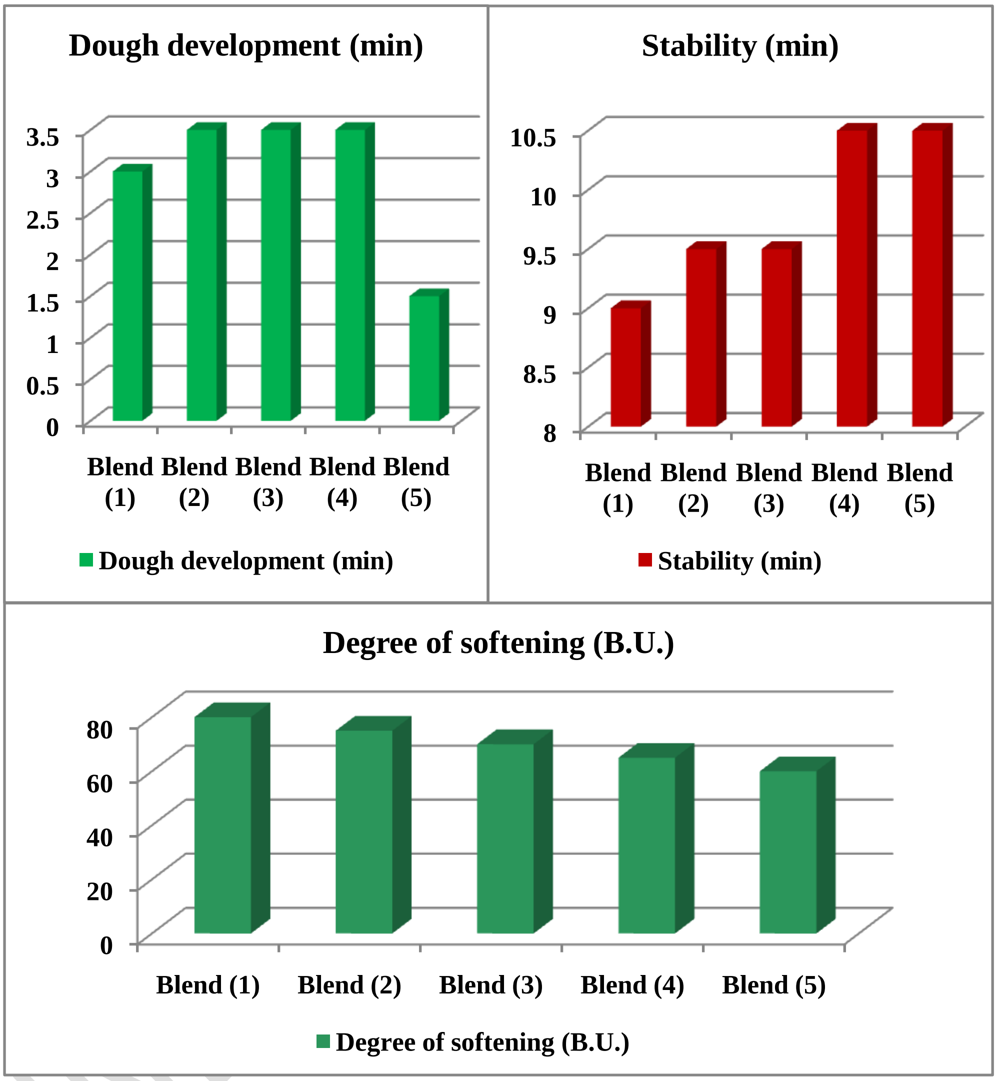
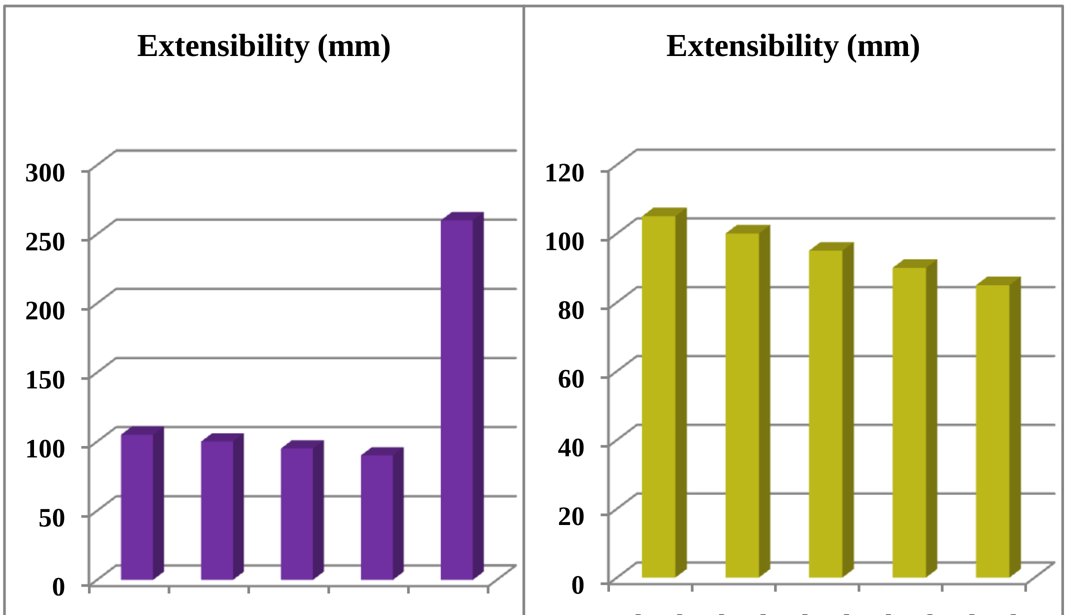


Fig.1. Rheological characteristics for different treatments balady bread with farenopgraph.



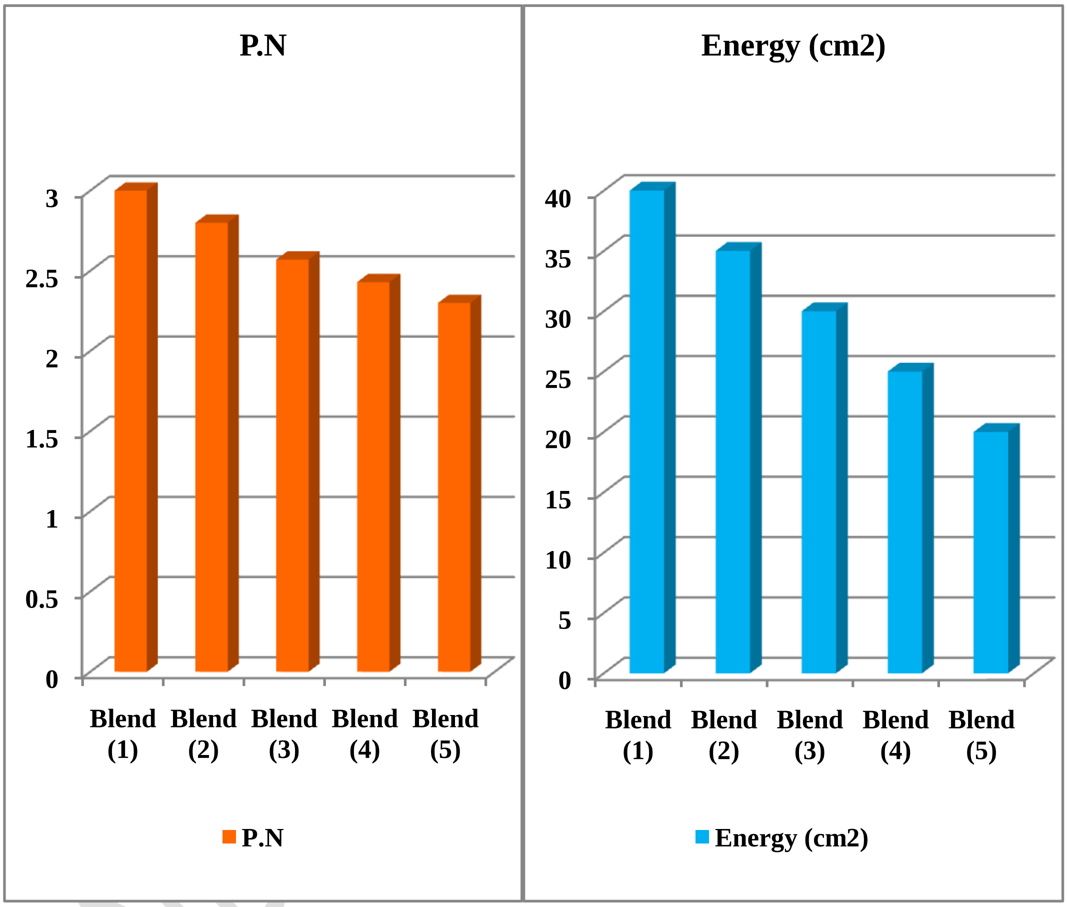


Fig.2. Rheological characteristics for different treatments balady bread with extensopgraph.

3.6.Hedonic sensory assessment and overall acceptability of blends

The sensory assessment of general Appearance, taste, crust color, separation of layers, rounder, distribution of crumb, and odor of balady bread prepared from wheat flour, naked barley flour and rice flour of different levels, and breads prepared from 100% of wheat flour were evaluated by twenty panelists. The gotten results were statistically investigated, and recorded in Table 1 and photo 1. From the data obtainable in Table1, it could be observed that Appearance, color, odor, texture and overall acceptability B1 have higher scores than B5.The other blends(B2, B3,andB4) sensory characteristics of balady bread blends contained wheat flour; naked barley flour and rice flour were nearly similar with those of B1. Contrarily, balady bread prepared from wheat flour, naked barely flour and rice flour tended to decrease the overall scores in compared with those balady bread which prepared from 100% of wheat flour. The found results approved with those stated by [18,32] .

Table 6. Sensory assessment of balady bread

	Balady bread	Treatments				
		B1	B2	B3	B4	B5
Sensory evaluation	General Appearance (20)	18.84[a] ±0.32	19.05[a] ±0.28	18.13[ab] ±0.47	17.81[ab] ±0.57	17.21[b] ±0.42
	Taste (20)	18.68[a] ±0.35	18.13[ab] ±0.64	18.23[ab] ±0.64	17.65[ab] ±0.45	16.76[b] ±0.53
	Crust color (10)	9.26[a] ±0.14	9.65[a] ±0.45	8.81[a] ±0.43	8.86[a] ±0.25	7.57[b] ±0.29
	Separation of layers (15)	14.11[ab] ±0.27	14.31[a] ±0.18	13.61[ab] ±0.27	13.81[ab] ±0.28	13.34[b] ±0.34
	Rounder (10)	9.42[a] ±0.18	9.28[a] ±0.16	8.94[a] ±0.24	8.81[ab] ±0.26	8.18[b] ±0.35
	Distribution of crumb (10)	9.36[a] ±0.17	9.15[a] ±0.21	8.92[a] ±0.25	8.86[a] ±0.24	8.11[b] ±0.26
	Odor (15)	13.74[a] ±0.38	14.32[a] ±0.18	13.61[a] ±0.24	13.39[ab] ±0.27	12.68[b] ±0.37
	Over all scores (100)	93.41	93.89	90.25	89.19	83.85
	Overall assessment	□ □ □ □	□ □ □ □ [	□ □ □	□ □	□

-Means with different letter in the same row are significantly different at $(p \leq 0.05)$.
- Each value was an average of twenty determinations ± there are a difference between Average and standard deviation.

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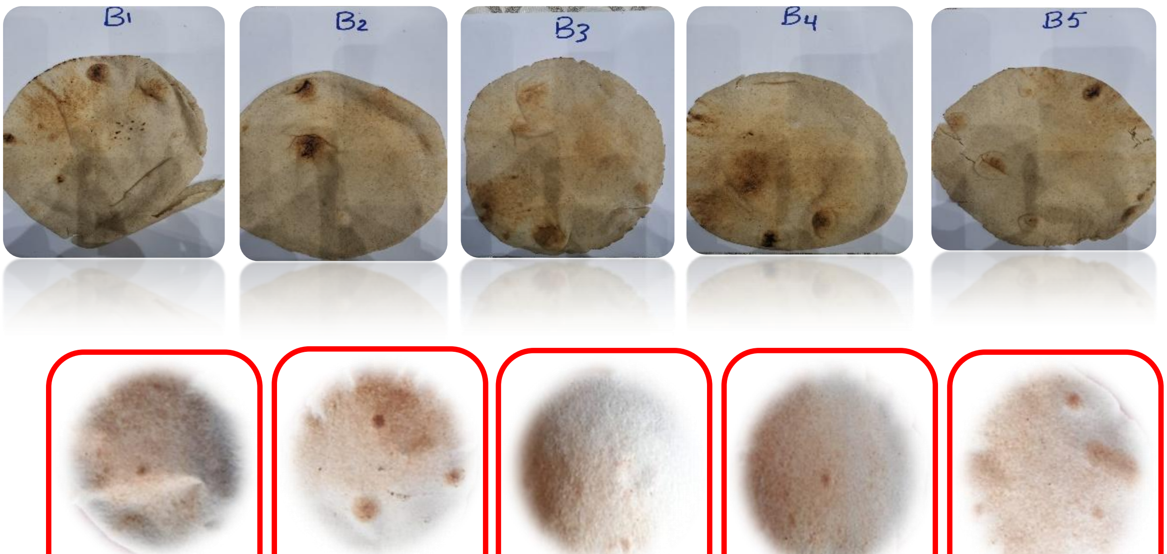

Photo 1. Shape balady bread made from different treatments

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3.7.Water activity of Blends

Data in Fig.3. presented the water activity of balady bread blends. Fig. 2 showed that tracking water activity (zero time) in different blends were (0.87, 0.89, 0.88, 0.86 and 0.87) in blends (1, 2, 3, 4 and 5), respectively. Also water activity (after 24 h) in different blends were (0.93, 0.92, 0.92, 0.92 and 0.94) in blends (1, 2, 3, 4 and 5), respectively.

Water is a food constituent that influences the stability, quality, and physical attributes of the food. The ratio of the vapour partial pressure of water in food to the vapour partial pressure of pure water at the same temperature and total pressure is described as water active - a_w [36]. A measure defining 'water availability' in materials. In both the liquid and solid states, water has an impact on the rheological properties of food. Water has an effect on the responsiveness of solid foods to force. Plasticizing or anti-plasticizing effects might occur when the water content is increased [37] .Deformation is facilitated by the plasticization of polymer chains, and brittle material becomes more soft and flowable while losing crispness. The compression test was earlier studied [38] to investigate the textural qualities of crispy bread as a function of water content. They detected plasticizing effects of water between 3 and 9 %, followed by apparent hardness of the material up to 11 %. The perceived stiffness modules reduced after 11 percent water content, and the softening effect of water became dominant. The anti-plasticizing effect has been seen in several circumstances. Adsorbed water gives the material more strength and makes it less brittle. According to [39] failure stress of flat wheat and rye bread increased as moisture was absorbed, reaching at an a_w range of 0.5 to 0.6. Cooking causes the majority of crystalline structures in native starch to disappear, hence baked and extruded cereal products are often glassy. Above their glass transition temperature, products suffer modifications that present themselves in a variety of ways, including changes in mechanical properties. The tensile characteristics of cellular products can increase as they densify [40].The force-deformation correlations of brittle and crunchy foods are known to be very irregular and irreproducible [41].

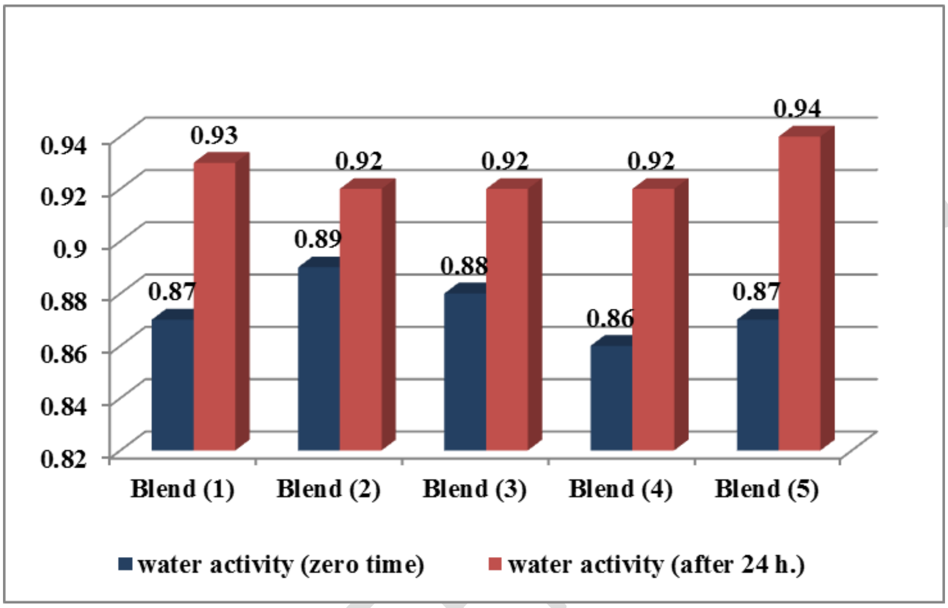

Fig. 3. Water activity for blends balady bread .

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Conclusion

In these studies, the results concluded that wheat flour could be replaced with broken rice at the level 5% and naked barley flour at the levels from 5 to 20 percentage effect on the technological quality and sensory evaluation for balady bread. The final products balady bread were rich of crude protein, crude fiber, ash, ether extract and different minerals such as (Ca, K, Mg and Na as a macro elements) and (Fe and Cu as a micro elements). Finally, it could be making some high-quality bakery products using NBF, RF with WF that are proper for consumers.

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