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# Comparative Study of Grains, Flours and Baking Quality of Wheat Cultivar (Uruq) with Other Wheat Cultivars (*Triticumaestivum* L.) in Iraq

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**Abstract:**
The grain hardness, wet and dry gluten contents, protein and ash contents are determined in grains from different cultivars of wheat which are important in food products, either which are present in raw materials or in final products. Wheat is also a very important food raw material, and flour as the final product of milling. The importance of knowing the physical and chemical properties of wheat and flour is due to the determination of quality and kind of flour which is produced after the milling process. In this work, some physical and chemical properties of different wheat cultivars are determined and the comparisons of these characteristics are performed in both wheat and flour. Uruq Wheat sample (W5) has the highest results when compared with other wheat cultivar reaching 82 kg/ hectoliter, 9.2 % and 41 gm, 0.81, 8.8, 5.5, 30 %, 67 %, 73.6 %, 518, 858 specific weight, moister, 1000 grain Weight (gm), Ash %, Moister %, color test, moist. gluten %, Gluten index %, Absorption %, Falling No. and gelatination respectivelywith specifications grain white, transparent color, uneven gully depth and full cross-section of a glasses grain. The lowest results are by contrast with Forat cultivar in sample W2. Characteristics that are observed in this work are affect of the contents of with to moister, ash, protein, gluten and water absorption values there are useful for milling industry of different wheat cultivars.

**Key word**s: Grains, Flours, Bread wheat, Uruq cultivar.

## Introduction:

Wheat is a milled raw material, which is today, together with rice, make the most important food raw material. Wheat's chemical content and economic production make it the main resource for multi phase production of different food, chemical and pharmaceutical products [1]. Wheat, as well as other corns, present the cheapest source of energy and calories [2]. Determining moisture content is an essential first step in analyzing wheat or flour quality since this data is used for other tests, moisture is also an indicator of grain storability, wheat or flour with high moisture content attracts mold, bacteria and insects, all of which cause deterioration during storage. Wheat or flour with low

moisture content is more stable during storage; moisture content can be an indicator of profitability in milling [3]. It has to be taken into consideration that in mind, mill industry needs to make experiments on quality and determination of some important content such as protein, wet gluten content, ash, moisture content etc., because the ingredients dictate the intended use of flour. The Iraqi bread is an important change food. It is made from imported wheat and wheat importation represents an immense drain on the economy while also suppressing and displacing indigenous cereals, with a resultant detrimental effect on agricultural and technological development. Wheat flour is an excellent source of complex carbohydrates [4,5]. Reducing dough extensibility is the protein fraction that is responsible for dough strength [6]. The focus is on the technological parameters like rheological properties and gluten content. Some investigations show the effect of sampling or harvesting time on the element contentof winter wheat flour and energetic values of flour which depend on the content of some important constituents such as protein, ash, moisture, etc. [7]. The importance of protein content lies in the ability of gluten to produce dough with the desired rheological properties [8].Viscoelasticity is one of the basic properties of gluten [9]. The ash content in wheat and flour has significance for milling,ash in flour can affect color, imparting a darker color to finished products [10]. In this work, five samples of different cultivar of wheat are tested, where each sample is ten times tested and an average values are calculated. The aim of this work is to show the importance of determination of quality of five cultivars bread wheat and corresponding flour, which are the most used in many food processes. Measurements of wheat characteristics are performed during its storage. Finally the aims of the study we compared between five cultivars through the many quality properties.

## Material and Methods:

Five samples of different cultivar of wheat are tested (Dijlah, Forat, Ebaa 99, Inia 66 and Uruq) and marked as the samples from W1 to W5 in order to determine the quality properties of the grains and their flour. All cultivars and flour are marked in figures as series. The types of flour are the most produced in our mill industry of all other types. The following parameters of grains and flour are tested: wet gluten content and gluten Index (Glutamatic, AACC method 38-12), moisture content (Motomco Moisture, AACC1976 model 919). The rheological properties of bread dough through water absorption (amount of water required for the dough to have consistency of 500 Brabensder units line), arrival time (the time in minutes required for the curve to reach the 500 Brabensder unit line after the mixer will be started and water will be added, mixing time (the time in minutes from the first addition of the water to the development of dough's maximum consistency), stability (the time in minutes elapsing when the top of the curve interacts first 500 U. line leaves) and softening of wheat flour dough and its blends are determined according to AACC [11] (1987) methods using a Farinograph type (PL) (Barbensder Farinograph, Germany). 300 grams of tested samples (14% moisture basis) are used. Extensograph test is carried out to measure the following data: dough extensibility (E) (the total length of the base of the extensogram measured in millimeters), dough resistance to extension (R) (the height of the extensograph curve is measured in Brabensder units after 5 minutes from the start, dough energy (represented by the area in Cm2 out lined the curve) and the peak height (the maximum height of

the extensograph curve measured in Brabensder units). Bread is made using the 100g straight dough method. The basic formula included 100 g of flour, 2 g of compressed baker's yeast 1 g of sucrose, 2 g of salt, 1 g of shortening, water as needed which has been added on a flour replacement basis. The dough is fermented for 60 min. at 30ºC following proof period for 15 min. Breads are baked at 230ºC for 25 min. The average weight of loaves is recorded after cooling the loaves. The loaf volume is measured by the rapeseed displacement method according to AACC [11] (1987) method. The specific volume (g/ $cm^3$) is calculated by dividing volume of the loaf by its weight [12]. Ash content (Muffle furnance, AACC), specific weight (Hectliter Weight type MLD-100), thousand grain test (numgral 1, Chopin ECC method), falling number [13], gelatination Index (Amylograph- E, ICC standard no. 126/1), flour absorption and color (Satake, UK- national standard flour). All results are expressed as percentage. 100 g of wheat is ground and mixed in original glass test tube. Glass test tube is filled to the top, closed and put in device for determination. The above mentioned parameters of wheat and flour are determined by different devices and methods.

## Results and Discussions:

The content of the grain moisture, thousand-grains and hectoliter weight and specific weight tests were compared in five wheat (*Triticumaestivum*L.) cultivars. Uruq Wheat sample (W5) was the highest reached 82 kg/ hectoliter, 9.2% and 41 gm with specifications grain white, transparent color, uneven gully depth and full cross-section of a glasses grain, but the lowest is Forat cultivar in sample W2 and W1, 68.1kg/ hectoliter, 6.7% and 21.5 gm respectively Figure.1 with specification grain are larger than the cultivar of the Dijlah and with a wide gully and gummy (profound effect on the shape of the grain) white color less than Uruq, and full cross-section of a transparence glasses grain.

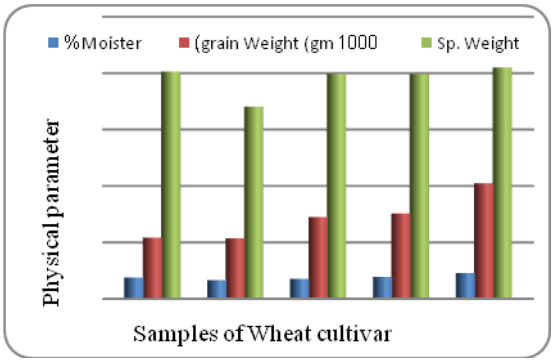


**Fig.1: The Differences between the Five Wheat Cultivars in Some Physical Parameters.**

According to the results (Fig.2), the moisture content for Dijlah wheat flour W1 ranged from 10.8%, sample W5 to 8.8%,. The moisture content in sample W5 flour type Uruq is near than the ranged in samples W3 and sample W4. According to valid regulations in B &H, the maximum allowed moisture content is 14% in wheat and 15% for flour. Average ash content in wheat cultivaries is presented in Figure 2. The highest value of ash content in flour wheat is in sample W2, 1%, and the lowest in sample, W1, W2 reached 0.81%. In addition the color measurement test appeared equal to the W1 and W5, 5.5 where differences in W2, W3 and W4 are reached 7, 4.8 and 5.1 (Fig.2).

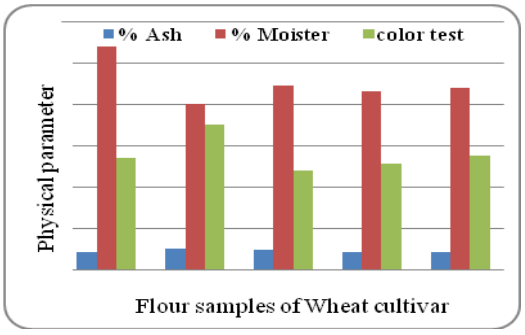


**Fig. 2: The Differences between the Flour of Five Wheat Cultivars in Ash, Moister and Color tests.**

The gluten fraction is the great important for flour and wheat, it is also important to determine it (Fig.3). An average wet gluten content for flour wheat is the highest in the cv. Forat (W2), 54%, while had the lowest value in sample cv. Uruq (W5), 30%. Regarding the gluten Index results obtained by analyses, the gluten Index is the highest for cultivar Dijlah (W1) sample, 67%, and the lowest value is 33%, sample Inia66 (W4) flour. The results of an average absorption values for five wheat cultivars are shown in fig.3. The water absorption value is the highest for flour Uruq sample (W5), 73.6%, but the lowest is determined for the sample, Inia 66 (W4), 66%. According to the results obtained by the analyses, the absorption value for flour of Uruq cultivar ranged from 73.8%, sample W5, to 66%, sample W4 fig.3. The popularity of wheat is based on diverse uses, resistance to many pathogens and pests, low cost of production, rapid growth, genetic flexibility and adaptability to different climates. The unique bread making quality is related to the type and quantity of gluten proteins, especially the high molecular weight gluten in subunits that are synthesized and stored in the seed endosperm. Recent advances in genetic transformation of wheat, including the integration and expression of high molecular weight glutenin subunit genes, make it possible to engineer the gluten proteins in order to improve bread making qualities [14].

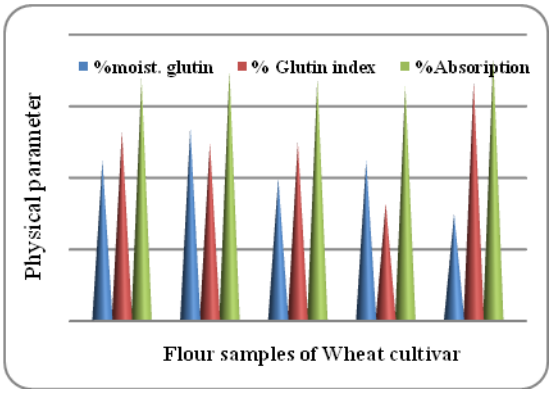


**Fig. 3: The Differences between the Flour of Five Cultivars in Wet. Gluten%, Gluten Index% and Absorption %.**

The falling number of five cultivars wheat and flour products is presented in fig. 4. The highest value of falling no. is in flour sample W4 and W2, 625 and 610 respectively, while the lowest is 505 in sample W1. The gelatination in wheat, by contrast is ranged from 896 Brabensder units (B. U) and 892 B. U. in sample W1and W3 Fig. 4.

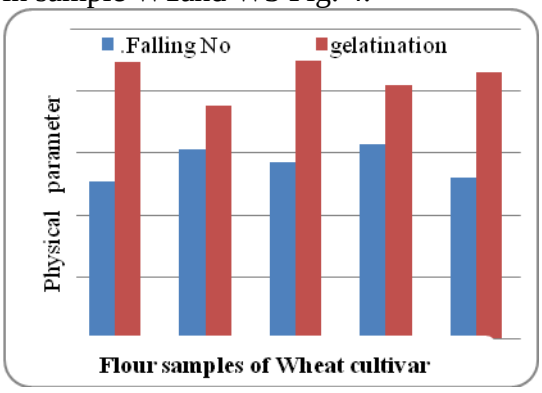


**Fig. 4: The Differences between the Flour of Five Cultivars in Falling no. and Gelatination.**

The results presented on Table (1) show the differences between the cultivar flours on baking characteristics of bread. Loaf volume of samples of wheat W5, 400 cm3 decrease in other samples of wheat cultivar into 395, 392, 393 and 397 cm3 in W3 and W4, W2, W1breads respectively. These decreases may be due to the decreases of gluten [15], the decreases of gluten by fibers have a real weakness effects on dough blends.

These results are agree with the results of [16] and [1] for wheat brain fiber.

**Table 1: Baking Characteristics of Bread For Different Cultivar Wheat Flours.**

| Wheat Flours Samples | Color | Taste And Odor | Chew | Loaf Volume $Cm^3$ | Dough Process Characterize |
|---|---|---|---|---|---|
| W1 | Tend to white | Good | Good | 397 | Homogeneous |
| W2 | Tend to yellow | Good | Good | 393 | Homogeneous |
| W3 | Tend to white | Good | Good | 395 | Homogeneous |
| W4 | Tend to white | Good | Good | 392 | Homogeneous |
| W5 | Tend to white | very low percent of Sweet taste | Good | 400 | More and faster homogeneous |

## Conclusions:

Gluten is a bioactive compound and it is among the most frequently identified for their medicinal and health attributes. However, there are many unknown factors associated with genotype optimization and crop growing environments in relation to the productivity of bioactive compounds in wheat. Based on experimental data obtained through chemical analyses of wheat and flour, the following can be concluded. It is very important to establish permanent control of wheat as well as flour, it has been seen that some samples had higher moisture content than it is allowed regarding the regulation. Wet gluten content is particularly important to determine because some people can have negative consequences to health if they consume flour containing it. The most important parameter to monitor input values ofwheat quality is control of moisture content, which gives information on possible microbiological contamination, the influence of moisture content on proteins in tested samples shows that wheat has optimal value of moisture content, as well as very good quality. The moisture content of wheat in sample W5 and W3, 8.8% and 8.9% is suitable and allowed by valid regulation for wheat and mill products in B&H, which means that these cultivars can limit the microbiological contamination and good for use in milling process.

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# دراسة مقارنة لنوعية حبوب وطحين وخبازية صنف الحنطة (*Triticumaestivum* L.) أوروك مع أصناف أخرى في العراق

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**الخلاصة:**
تم تحديد صلابة الحبوب، ومحتوى الكلوتين الجاف والرطب، ومحتوى البروتيني والرماد في الحبوب لاصناف مختلفة لحنطة التي هي مهمة في الصناعات الغذائية، سواء كانت موجودة في المواد الخام او المنتج النهائي. والحنطة مهمة كذلك للمواد الخام الغذائية والطحين كناتج نهائي لعملية الطحن. ان من المهم معرفة الخصائص الفيزياوية والكيميائية للحنطة والطحين التي تؤدي الى تحديد النوعية ونوع الطحين الذي ينتج من عملية الطحن. في هذا العمل، بعض الخصائص الفيزيائية والكيميائية لاصناف الحنطة المختلفة تمكن تحديد ومقارنة بين خصائصها وتمييزها في كلا من الحنطة والطحين. اعطى نموذج الحنطة نوع اوروك ($W_5$) افضل النتائج مقارنة مع بقية الاصناف التي وصلت عند 82 كليوغرام/ هكتولتر،9,2% ،41 غرام، 0,81، 8,8، 5,5، 30 %، 67 %، 73,6 %، 518، 858 للوزن النوعي، الرطوبة، وزن الف حبة (غرام)، الرماد، النسبة المئوية للرطوبة، النسبة المئوية للكلوتين الرطب، النسبة المئوية لمعامل الكلوتين، النسبة المئوية للامتصاص، رقم السقوطو الهلامية على الترتيب مع نوعية بياض الحبوب، شفافية اللون، من الرمادي متفاوت ومقطع عرضي للحبة الشفافة، بينما النتائج الادنى عند نموذج صنف حنطة الفرات ($W_2$). واتضح من خلال النتائج أن هناك تفاوتاً في محتوى الرطوبة، الرماد، البروتين، الكلوتين ومعدلات امتصاص الماء التي هي مفيدة في مصانع الطحن لمختلف أصناف الحنطة.

**الكلمات المفتاحية:** حبوب، طحين، حنطة الخبز، الصنف أوروك.