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Chemical Composition of Two Varieties of Barley Grown in Murzuq Area, Libya

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ABSTRACT

This study was conducted in the department of food science and technology, faculty of food Science, Wadi Al-Shati University, and aimed to investigate the chemical composition of Tarida barley, which is considered one of the rare varieties, compared to Rayhan barley which is widely cultivated and consumed in in the southwest of Libya. Grain samples were analyzed for moisture crude ash, crude protein, crude fat, total carbohydrates and crude fiber. The protein content of in Tarida barley, 12.21%, was higher than in Rayhan. The results showed that the Tarida variety has the highest fat content; however, the difference was not significant. Crude fiber in Tarida was 2.03%, while it was higher in Rayhan, 4.35%. Tarida barley accumulated the higher amount of β-glucan (3.74%). The contents of the Tarida variety of mineral elements, potassium, magnesium, calcium, manganese, iron, copper, and zinc, were 6731, 543, 356, 9.71, 314, 1.33, 42.8, while in Rayhan the contents of these elements were 5978, 611, 351, 7.29, 253, 1.64, 57.15 mg/100g respectively.

التركيب الكيميائى لصنفين من الشعير المزروع في منطقة مرزق، ليبيا

محمد أحمد وربيعة إبراهيم

أُجريت هذه الدراسة في قسم علوم وتقنية الأغذية، كلية علوم الأغذية، جامعة وادي الشاطئ، وهدفت إلى معرفة التركيب الكيميائى لشعير التاريدة الذي يعتبر من الأصناف النادرة مقارنة بشعير الريحان المنتشر وتتم زراعته واستهلاكه على نطاق واسع في جنوب غرب ليبيا. تم تحليل عينات الحبوب لقياس الرطوبة والرماد والبروتين والدهون والكربوهيدرات الكلية والألياف الخام، وكان محتوى البروتين في شعير التاريدة 12.21% أعلى منه في شعير الريحان، وأظهرت النتائج أن صنف التاريدة يحتوي على أعلى نسبة دهون، إلا أن الفرق لم يكن كبيراً. كانت نسبة الألياف الخام في شعير التاريدة 2.03%، بينما بلغت في شعير الريحان 4.35%. احتوى شعير التاريدة على كمية أعلى من بيتا جلوكان (3.74%)، كما بلغت محتويات التاريدة من العناصر المعدنية البوتاسيوم والمغنيسيوم والكالسيوم والمنغنيز والحديد والنحاس والزنك 6731، 543، 356، 9.71، 314، 1.33، 42.8، أما في شعير الريحان فقد بلغت محتويات هذه العناصر 5978، 611، 351، 7.29، 253، 1.64، 57.15 ملجم/100 جرام على التوالي.

INTRODUCTION

Food grains are of great economic importance in the world, as they are one of the most important sources of basic food for humans. Grains are a source of carbohydrates and the cheapest source of calories. (Shalqam and Shuwayliyah, 2001). In addition to being the basis for many food industries that are important in the international economy, the most important of which are wheat and barley, as they are strategic crops for the majority of the world's population. Cereal crops are the most significant globally in terms of both economic and social significance (Pagani, et al., 2020). Furthermore, because cereal grains had a variety of minerals, fiber, phenolic compounds, and vitamins, they had a complete influence on human existence (Awulachew, 2020).

Despite this, cereal grains are primarily made up of three components: germ, bran, and endosperm. These components are utilized to make bakery goods and include a variety of nutrients (Ciudad-Mulero et al., 2021). Consequently, all cereal crops have major roles in healthcare, notably in treating heart disease, body mass index, and diabetes (Ahmed et al., 2014). Because grain contains less gluten, barley is highly nutritious with high levels of lysine, thiamine, and riboflavin. grain is also readily digested (Marwat et al., 2012). Barley grain is a great source of vitamins and minerals (Kerckhoffs et al., 2002). Barley is a fundamental component used in the brewing of beer and is widely used in European cattle feeds. Additionally, barley flour aids wheat flour in baking since it has a lower protein content and a higher fiber content (Alijošius et al., 2016). Consequently, barley's nutritional value is associated with β-gucans, which are the primary ingredient and beneficial for health (Awulachew, 2020). Numerous investigations have been carried out to ascertain the physical and chemical composition of wheat grains. Since the variety and other factors affect the nutritional content of barley, it is crucial to look at its chemical composition. This study's goal was to assess the chemical composition of two types of barley that are cultivated and consumed in southwest Libya.

Materials and Methods

Barley grains bring from a local store in Murzuq. In order to obtain flour, barley grains were ground in the grain laboratory at the Faculty of Food Sciences, Wadi Al-Shati University, Libya.

METHODS

PROXIMATE COMPOSITION

The samples were analyzed proximally for moisture, crude protein, ash, and crude fat in accordance with American Association of Cereal Chemists (AACC, 2000) procedures 44-19, 46-12, 08-01, and 30-26, respectively. Carbohydrate was calculated by difference. Potassium, magnesium, calcium, manganese, iron, copper and zinc were determined by performing wet ash of the samples used by taking 1 gram of the sample and wet-ashing it by adding sulfuric and nitric acid and hydrogen peroxide, then filtering on ashless filter paper and receiving the filtrate in a standard 50 ml beaker. ml, and measure the elements using an Atomic Absorption Spectrophotometer type 2380 Perkin Elmer. All results are expressed on a wet basis.

β-GLUCANS DETERMINATION

β-glucans were determined using a Megazyme test kit, which adheres to McCleary and Codd (1991) and McCleary and Glennie-Holmes (1985) methods and employs certain enzymes. The kit for detecting fermented β-glucans (K-BGLU 11/07) was acquired from Megazyme (Ireland).

The data were analyzed statistically using One-way ANOVA, and differences between treatments were calculated using Fishers multiple range tests $P<0.05$ using the Sigma-Stat program.

Results and discussion

The results in Table 1 showed that the moisture percentage in the Tarida variety was 6.98, while the moisture percentage in the Rayhan variety was 6.47. This is considered a good and appropriate percentage for preserving barley without any chemical or microbial changes occurring during storage, as the appropriate moisture percentage for preserving grains in good condition is less than 14%. during storage (Khan, 2016). Thus, there are no significant differences between the Tarida variety and Rayhan variety.

The total ash in Tarida barley was 4.19%, which is slightly lower than Rayhan barley, which had an ash percentage of 4.79. This is due to Rayhan barley containing a higher percentage of coatings, while Tarida barley is considered devoid of outer coverings (Kent, 1980). The results obtained for Rayhan barley were agrees with what was stated by Al-Barkoli (2007). There are no significant differences between the two types.

The percentage of protein in both varieties was 12.21 for taraida and 11.19 for Rayhan barley, and the results were consistent with what was reported by (Shalaby et al., 2014) and (Abdul Majeed *et al.,* 2017). It is noted that there is a difference in the percentage of protein between the two varieties and that there are significant differences between them ($p \leq 0.05$). The difference in the percentage of protein depends on the climatic conditions, as the high percentage of humidity during maturity and harvest leads to an increase in the effectiveness of proteolytic enzymes and thus leads to a decrease in the percentage of protein, and may be due to a change in genetic characteristics (Ibrahim, 2004; Gadan and Bahnasawy, 2004).

Fats in grains have an important role as they are considered a source of energy and a source of vitamin E. They also have a role in storage, preservation and manufacturing processes (Morrison, 1978). The results obtained indicated that the percentage of fat in Tarida barley was 2.39, while in Rayhan barley it was 2.58. The results were consistent with what was reported by previous studies (Al-Barkoli, 2007; Shalaby, et al., 2014; Abdul Majeed *et al.,* 2017). It is clear that there are no significant differences in the percentage of fat between the two types.

The total carbohydrates in Rayhan barley were higher than in Tarida barley. This is due to the fact that Tarida barley contains a smaller amount of coats and thus the percentage of insoluble carbohydrates was lower (Pomerans, 1971). The percentage of total carbohydrates in Tarida barley was 74.23 and in Rayhan barley was

74.97, where the percentage difference was fairly close and there were no significant differences.
Dietary fiber in Tarida barley is 2.03%, while in Rayhan barley it is 4.35. Thus, the amount of fiber in Rayhan barley (hulled barley) is higher than in Tarida without husk, and there are significant differences between the two varieties. The results were consistent with what was mentioned (Abdul Majeed *et al.*, 2017).

Table (1): Chemical composition of both barley varieties (Tareda and Rayhan) based on dry weight

Barley variety	Tarida	Rayhan
Moisture	6.98 ±0.52	6.47 ±0.49
Crude ash	4.19 ±0.74	4.79 ±0.61
Crude Protein	12.21 ±0.22	11.19 ±0.45
Crude Fat	2.39 ±0.23	2.58 ±0.31
Total carbohydrates	74.23 ±0.91	74.97 ±0.84
Crude fiber	2.03 ±0.12	4.35 ±0.27

The values shown in the table represent the average of three replicates; ± standard deviation

Table 2 presents the results of β-glucan amount in Tarida and Rayhan barely grains. The β-glucan content in both varieties was 3.74% for Tarida and 1.96% for Rayhan barley. According to Rodehutscord *et al.* (2016), the average amount of barley β-glucans in different varieties was 4.67% DM.

Table (2): β-glucan content of barley grains (Tareda and Rayhan) based on dry weight

Barley variety	β-glucan content
Tarida	3.74 ±0.35
Rayhan	1.96 ±0.17

The values shown in the table represent the average of three replicates; ± standard deviation

The results in Table 3 showed the content of some mineral elements in Tarida barley of, where the values of these elements were 6731, 543, 356, 9.71, 314, 1.33, 42.8 (mg/100g), potassium, magnesium, calcium, manganese, iron, copper and zinc, respectively.

In the barley variety of Rayhan, the mineral elements were 5978, 611, 351, 7.29, 253, 1.64, 57.15 (mg/100 g), potassium, magnesium, calcium, manganese, iron, copper, and zinc, respectively. It is concluded that the Tarida barley is superior in its content of potassium, calcium, manganese and iron to Rayhan barley, while Rayhan barley excels in its content of magnesium, copper and zinc.

Table (3): Content of some mineral elements of the two barley varieties, Tarida and Rayhan

Elements	Tarida barley (mg/100g)	Rayhan barley (mg/100g)
Potassium (K)	6731 ±0.40	5978 ±0.31
Magnesium (Mg)	543 ±0.10	611 ±0.11
Calcium (Ca)	356 ±0.50	351 ±0.09
Manganese (Mn)	9.71 ±0.07	7.29 ±0.08
Iron (Fe)	314 ±0.30	253 ±0.09
Copper (Cu)	1.33 ±0.05	1.64 ±0.06
Zinc (Zn)	42.8 ±0.06	57.15 ±0.07

The values shown in the table represent the average of three replicates; ± standard deviation

CONCLUSION

The present study presented substantial differences in chemical composition between Tarida and Rayhan barley varieties grown in Libya. In Tarida and Rayhan varieties, the crude protein of 12.21% DM and 11.19% DM, respectively. Tarida had lower content of crude dietary fiber. β-glucans content was determined and it was found that Tarida and Rayhan barley accumulated different amounts of β-glucans. The highest amount of β-glucans (3.74% DM), was accumulated in Tarida barley.

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