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EXAMINATION OF FIRIK PRODUCED IN HATAY REGION IN TERMS OF NUTRITIONAL ASPECT

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ABSTRACT
In this study, nutritional value of Firik produced in Hatay region was examined by using four Firik samples collected from local farmers. Amount of protein, ash, moisture, total sugar, fat, salt, raw cellulose and fatty acid profile were determined and estimated values were compared with similar foods such as bulgur and rice. Protein and ash contents of Firik samples were higher than bulgur and rice, while sugar and fat contents were lower. In addition, higher amount of linoleic acid and remarkably adequate amount of linolenic acid generally known as essential fatty acids were obtained. The results showed that Firik produced in Hatay can be considered to use as a reinforcement ingredient for improving nutritional value of daily meals, as it has better nutritional properties than the other resemble carbohydrate-based foods.
Keywords: Firik, green wheat, roasted green wheat, Hatay

HATAY BÖLGESİNDE ÜRETİLEN FİRİĞİN BESİNSEL DEĞERLERİNİN İNCELENMESİ

ÖZ
Bu çalışmada, Hatay bölgesinde üretilen Firiğin besin değeri, dört Firik numunesi kullanılarak incelenmiştir. Firik örneklerinin protein, kül, nem, toplam şeker, yağ, tuz, ham selüloz içerikleri ve yağ asidi profili belirlenerek elde edilen değerler bulgur ve pirinç gibi benzer gıdalar ile karşılaştırılmıştır. Firiğin, protein ve kül içeriği bulgur ve pirinçten yüksek, şeker ve yağ içeriği ise daha düşüktür. Buna ek olarak, esansiyel yağ asitleri olarak bilinen yüksek miktarda linoleik asit ve oldukça uygun miktarda linolenik asit elde edilmiştir. Sonuç olarak, Hatay'da üretilen Firiğin karbonhidrat esaslı diğer gıdalardan daha iyi besinsel özelliklere sahiptir. Elde edilen veriler Firik günlük diyetin besin değerini artırmak için kullanılabileceğini göstermektedir.
Anahtar kelimeler: Firik, yeşil buğday, kavrulmuş yeşil buğday, Hatay

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INTRODUCTION

Hatay is a pretty Mediterranean city with a long history, diverse culture and so many traditional foods. It was a cradle to lot of civilization and has a rich cultural and historical saving. It grants privilege to Antakya from other cities in that it has a wide range of specific food in cultural treasures. However the most of these traditional food products are not well known in other regions of the Turkey (Dizlek 2010, Dizlek and Şahin 2013). Firik is the one of these products. Firik (Frekeh, Frikeh or Freekeh) also called as roasted green wheat is a carbohydrate based traditional food generally known in Turkey, Greece, Cyprus, Middle East, North Africa and even Continent of Australia regions (Ozkaya et al. 1999; Williams and El-Haremein 1985; Dick and Matsuo 1988). In the production process of Firik, early harvested spikes are burned on fire then roasted spikes are dried under sun and at the end threshed are removed from hulls. Roasting process gives characteristic flavour and texture to Firik like slightly sweet, chewy with a desirable smoked flavour (Musselman and Mouslem 2001; Williams and El-Haramein 1985).

Nutritional composition of Firik from different regions is usually 77% of carbohydrate, 12.7% of protein, 16.5% of dietary fibre, small amounts of vitamin A, B1, B2, C, E and high amounts of potassium, magnesium and calcium in mineral composition (Bird and Mular 2003). According to literature, Firik has many health benefits such as being low in glycaemic index (GI) and fat, high in fibre and protein, rich in calcium, iron, zinc, zeaxanthin and lutein as well as having a good prebiotic effect. Due to the low cholesterol and high diet fibre characteristics, Firik helps the absorption of minerals in intestines and prevents cardiovascular, diabetic diseases and obesity as well. Because of all these positive attributes, Firik is called as a functional-traditional food (D'Edigio and Cecchini 1998; Humphries and Khachik 2003).

In studies related with chemical composition of wheat has been illustrated that maturation conditions and harvesting time have significant effect on ash and moisture contents and also amino acid composition of proteins (Ozkaya et al. 1999). Pythic acid content increases, while fibre content decreases with late maturation period. Due to these reason, early harvesting time (early stage of maturation) is considered as appreciate time for good nutritional value of Firik (Ozboy et al. 2001).

Firik consumption in Hatay region resembles rice and bulgur, and the most known dish is Firik-Pilav which includes Firik, bulgur, butter, some vegetables and spices (black pepper and salt). As a traditional food; Firik, has been sold in plastic film package with small portions (500-1000 g) and its price is eight times higher than durum wheat that brings local farmers economical advantage to sell their crops in higher prices. In this context, Firik has been thought as having high commercial value.

One of the important concepts in food industry is to determine nutritional values and modernize by formulating traditional foods and improving production methods (Dizlek et al. 2009). The objective of this study was to investigate nutritional content of Firik samples produced by local farmers in Hatay and compare this content with similar products such as bulgur and rice. Although, there have been a few works on Firik, as far as we have known that there have not been studies on nutritional composition of Firik which is produced in Hatay.

MATERIALS AND METHODS

Material

Four Firik samples collected from villages of Altınozu, Hatay (sample 1:Altınkaya, sample 2: Cetenli, sample 3: Boynuyogun and sample 4: Karbeyaz) were prepared in small pieces by grinding before each test and kept in dry, cool place until analyses.

Chemical Analysis

In order to determine nutritional content of Firik samples, chemical analyses such as moisture, protein, ash, fat, total sugar, salt, and raw cellulose were performed. Moisture, protein, and ash contents were determined according to American Association of Cereal Chemists International

(AACCI) approved Methods 44-15.02, 46-12.01, and 08-01.01, respectively (Anonymous 1995;). Moreover, Soxhlet apparatus were used to obtain fat content by using petroleum ether as organic solvent. Salt analysis was performed by using potassium chromate-titrimetric method (Mohr method) and raw cellulose analysis was conducted according to Kürschner-Hanack method which is based on insolubility of cellulose in water and its resistance to action of dilute acids and bases (Kraszkiewicz et al. 2015). In addition, total sugar content was also determined by the method of Dubois (Dubois et al. 1956). All analyses of Firik samples were performed triplicate and average values were calculated on dry basis.

Analytical Analysis

For the determination of fatty acids profile, firstly lipids were esterified in a two-step reaction with methanolic sodium and hydrochloric methanol (AFNOR 1984) and then analysed by using HP 6890 Gas Chromatography equipped with HP Innowax column. Helium was used as a carrier gas with the flow of 0.9 ml/min and the fatty acid methyl esters were detected by the comparison of retention times with known standards.

Statistical Analysis

Statistical analyses were performed to investigate significant differences in mean values by using one-way analysis of variance (ANOVA) and Tukey-b tests (multiple range test at $P < 0.05$) of SPSS 16.0 statistical software (SPSS, Inc., Chicago, IL, USA).

RESULTS

Chemical Analysis

Results presented in Table 1 illustrate that there are slightly differences between nutritional components of all samples. For instance, total sugar contents were ranged from 60.85 to 68.48% and sample C showed higher value of 68.48% than others. In addition, ash and moisture contents varied between 1.6 to 2.0% and 10 to 11%, respectively.

Table 1. Chemical composition of Firik samples (%)

Products	Ash	Moisture	Protein	Fat	Salt	Raw Cellulose	Total Sugars
A	1.61^{c}	10.72^{b}	13.42^{a}	1.56^{b}	0.26^{ab}	4.75^{a}	60.85^{d}
B	2.01^{a}	10.00^{d}	8.91^{c}	1.58^{b}	0.26^{ab}	4.65^{b}	61.47^{c}
C	1.85^{b}	10.94^{a}	11.23^{b}	1.86^{a}	0.31^{a}	2.63^{d}	68.48^{a}
D	1.98^{a}	10.65^{c}	12.19^{b}	1.90^{a}	0.24^{b}	3.19^{c}	61.90^{b}
Average	1.86	10.58	11.44	1.73	0.27	3.81	63.18
ANOVA	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$

[a]Different lowercase letters within the same column indicate significantly different values among different type of samples results in the same product-test type conditions (Tukey-b test, $p < 0.05$)

One of the important goals from this work was to examine protein content of Firik samples which was obtained average of 13%. Tukey-b test in Table 1 demonstrates that order regarding protein values is sample A with highest (13.42%) in the first group, C (11.23%) and D (12.19%) in the second group and sample B (8.91%) in the third group. Ozkaya et al (1999) and Ozboy et al (2001) displayed also same contents of protein in Firik samples which were produced in different maturation stages by boiling and roasting process. At these studies protein and ash content decreased slightly during maturation time.

As an assumption, average values of nutrient contents were found as; ash- 1.86%, protein 11.44%, fat-1.73%, salt- 0.27%, raw cellulose-3.81%, total sugar-63.18% and moisture-10.58% (Table 1). These results were slightly similar with the values found by Bird and Mular (2003).

Table 2. Chemical compositions of Bulgur, Rice and Firik (%)

Products	Ash	Moisture	Protein	Fat	Crude Fibre	Carbohydrate	References
White Rice	0.50	15.50	7.3	3.6	0.4	80.10	(Food Standards Agency and Institute of Food Research 2002)
Bulgur	0.92	11.20	9.00	N.A	5.6	69.3	(Caba et al, 2012)
Firik	1.86	10.58	11.44	1.73	3.81	63.18	In this study

Analytical Analysis

Results illustrated in Table 3 indicate that average fatty acids composition is 45.08% of linoleic acid (C18:2), 26.35% of oleic acid (C18:1), 22.5% of palmitic acid (C16:0), 2.99% of linolenic acid (C18:3), 2.14% of stearic acid (C18:0) and small quantity of other fatty acids (0.83% of C20:1 and 0.1% of C15:0). Moreover, ANOVA result displays that there are significant differences between samples according to palmitic, stearic, oleic, linoleic and linolenic acid quantities ($P < 0.05$). For instance, the highest amount of linoleic acid was identified in sample B, while the lowest amount was determined in sample A which had the highest oleic acid. These differences might be explained that fat content and profile can be affected by the climate, soil, harvesting time, processing conditions, etc.

Table 3. Fatty acid compositions of Firik samples

Sample	Fatty Acid Composition %						
	Pentadecanoic acid (C15:0)	Palmitic acid (C16:0)	Stearic acid (C18:0)	Oleic acid (C18:1)	Linoleic acid (C18:2)	Linolenic acid (C18:3)	Paullinic acid (C20:1)
A	0.11[a]	23.32[b]	2.46[a]	28.34[a]	42.30[d]	2.67[c]	0.80[a]
B	0.10[a]	21.17[d]	1.82[d]	26.49[b]	46.91[a]	2.71[c]	0.80[a]
C	0.10[a]	23.52[a]	2.12[c]	25.78[c]	44.73[c]	2.97[b]	0.78[a]
D	0.10[a]	22.00[c]	2.17[b]	24.80[d]	46.39[b]	3.61[a]	0.93[a]
Average	0.10	22.50	2.14	26.35	45.08	2.99	0.83
ANOVA	$P > 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P > 0.05$

[a]Different lowercase letters within the same column indicate significantly different values among different type of samples results in the same product-test type conditions (Tukey-b test, $P < 0.05$)

DISCUSSION

When comparison was made with bulgur and rice (Table 2), it can be noticed that Firik samples from Hatay region exhibited high protein content than other resemble cereals. Furthermore, ash content was also almost double time higher than bulgur and four times from rice (see Table 2) while total sugar value was lower than these cereals with the value of around 70 to 80%. In addition, amount of raw cellulose was higher than bulgur and rice due to production process of Firik made from early harvested green wheat which is usually collected when they are ripe. This might be explained that in the maturation period of grains, total sugar increases while cellulose content decreases in late harvested time.

It could be highlighted that Firik has average of 25% saturated fatty acids mainly composed of palmitic acid and of 75% unsaturated fatty acids included mostly linoleic and oleic acids. Here it should be considered that linoleic acid quantity was highest between all other fatty acids. As effects on human health for linoleic and linolenic acid is thought, Firik can be counted as healthy

nutritional food in daily diet due to possessing essential fatty acids in its own fat composition.

The high amount of ash, protein, essential fatty acids, raw cellulose and low amount of total sugar, salt in Firik samples can contribute health benefits and play a role in prevention of diseases such as diabetic, coronary artery, obesity and colon cancer etc. Firik can be advisable to use it on a daily diet, as it has better nutritional properties than other carbohydrate-based foods. Studies on this area are limited and due to many health's contributing characteristics of this functional food, research effort is required. It is expected that this paper might be helpful to fulfil the gap about importance of such a traditional food.

REFERENCES

Afnor (1984). Receuil des normes françaises des corps gras, grains oléagineux et produits dérivés, 3rd edn. *Association Française pour Normalisation*, Paris, p 95

Anonymous (1995). Approved Methods of the American Association of Cereal Chemists (9th ed.). St. Paul, MN: The Association.

Bird, A.R., Mular, M. (2003). Product analysis: green wheat Freekeh. *CSIRO Health Sciences and Nutrition, product analysis* report, (p. 4).

Caba, Z.T., Boyacioglu, M.H., Boyacioglu, D. (2011). Bioactive healthy components of bulgur. *Int J Food Sci Nutr*, 63 (2): 250-256.

D'Edigio, M.G., Cecchini, C. (1998). Immature wheat grains as functional foods. *Italian Food & Beverage Technology*, 14: 34.

Dick, J.W., Matsuo, R.R. (1988). Durum Wheat and Pasta Products. In Y. Pomeranz (Ed.), Wheat chemistry and technology (Vol. II, pp. 507-547). St. Paul, MN: *Am. Assoc. Cereal Chem.*American Assoc. Cereal Chem.

Dizlek, H., Gül, H. and Özer, M. S. (2009). Künefe. The Second Traditional Foods Symposium, 27-29 May 2009, *Symposium Book*, Van/TURKEY. 520-523.

Dizlek, H. (2010). Kulce. The First International Symposium on "Traditional Foods from Adriatic to Caucasus", April 15-17, 2010, *Symposium Book*, Tekirdağ/TURKEY.478-480.

Dizlek, H. and Şahin, T. (2013). A Traditional Delicious Belongs to Antakya Region: Peppery Bread. The 2nd International Symposium on "Traditional Foods from Adriatic toCaucasus", October 24-26, 2013, *Symposium Book*, Struga-Ohrid/MACEDONIA. 245.

Dubois, M., Gilles, K.A., Hamilton, J.K., Rebers, P.A., Smith, F. (1956). Colorimetric method for determination of sugars and related substances. *Anal Chem*, 28 (3): 350-356.

Food Standards Agency and Institute of Food Research (2002). McCance and Widdowson's The Composition of Foods, Sixth Summary Edition. *Royal Society of Chemistry*, Cambridge.

Humphries, J.M., Khachik, F. (2003). Distribution of lutein, zeaxanthin, and related geometrical isomers in fruit, vegetables, wheat, and pasta products. *J Agric Food Chem*, 51(5): 1322-1327.

Kraszkiewicz, A., Kachel-Jakubowska, M., Lorencowicz, E., Przywara, A. (2015). Influence of cellulose content in plant biomass on selected qualitative traits of pellets. *Agric. Agric. Sci. Procedia*, 7: 125-130.

Musselman, L.J., Mouslem, A.B. (2001). Frikeh, roasted green wheat. *Econ Bot*, 55 (2):187–189.

Ozboy, O., Ozkaya, B., Ozkaya, H., Koksel, H. (2001). Effects of wheat maturation and cooking method on dietary fiber and phytic acid contents of firik, a wheat-based local food. *Nahrung*, 45 (5): 347-349.

Ozkaya, B., Ozkaya, H., Eren, N., Unsal, A.S., Koksel, H. (1999). Effects of wheat maturation stage and cooking method on physical and chemical properties of firiks. *Food Chem.,* 66 (1): 97-102.

Ozkaya, B., Ozkaya, H., Koksel, H. (1998). Physical and chemical properties of firiks. *Getreide Mehl Brot,* 52 (5): 298-301.

Williams, P.C., El-Haremein, F.J. (1985). Frekeh making in Syria-A small but significant local industry. *Rachis*, 3 (2): 28-30.