Journal of Food Biosciences and Technology,
Islamic Azad University, Science and Research Branch, Vol. 14, No. 3, 61-70, 2024

Evaluation of the Effect of Oak Fruit Flour on the Properties of Baguettes using Texture, Color, Porosity, Chemical Compositions and Sensory Properties Analysis

M. Hojjatoleslamy [a] **, *E. Yazdanpanah*** [b *]

[a] Assistant Professor of the Department of Food Science and Technology, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran.
[b] Ph. D. Student in Food Science and Technology-Biotechnology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran.

Received: 7 July 2024 Accepted: 21 August 2024

ABSTRACT: Oak flour has long been used to produce a type of bread in the Zagros Mountains in Iran. It was also known as a natural medicinal food as a gastrointestinal disinfectant, analgesic for menstrual cramps and used to treat jaundice. The aim of this study was to combine oak flour and wheat flour to produce baguette bread. Oak fruit was milled after peeling and reducing its bitterness operations then It was added to wheat flour with 6, 8, 10, 12 and 14 weight percentages and used to produce bread then Texture, color, porosity and sensory tests were performed on treatments. The results indicated that by increasing the percentage of oak flour The texture of the bread weakened and the quality was reduced also The color difference index showed an increasing trend, Porosity test showed that the number of cavities per unit area decreases by increasing percentage of oak flour. Regarding sensory test, by increasing the percentage of oak flour, the flavor and shelf life of the samples decreased. Despite the decrease in the quality of the samples, it is possible to use oak flour in the amount of 12% or less.

Keywords: Breadmaking, Color, Physical Properties, Sensory Properties, Texture.

Introduction

The flour produced from oak fruit has long been used for producing traditional bread in different regions of Zagros, Iran. The main cultivar of this tree is in forests of western and northwest of Iran and includes 49% of the country's forests. Fruit of the oak tree with stretched elliptical form is located in white and velvet pylons (Hosseini *et al*., 2017; Sharifi *et al*., 2017; Pourreza *et al*., 2014). Starch, protein, fatty acids, fibers, minerals, vitamins such as A, C and B group are its main ingredients. Oak has been used extensively as a traditional medicine Therefore that it is considered as warm and dry diet. This fruit also contains a significant amount of biological compounds with antioxidant properties. Therefore, it can be regarded as an important source of food, food additive and medicinal food in the cereal grain industry (Nedamani *et al*., 2014; Nedamani *et al*., 2014)

In spite of abundance of this tree in different parts of the country, nowadays, oak is not used except occasional usage for

*Corresponding Author: Ehsany81@yahoo.com

animal feed. Therefore, using oak products as food or food additive can assist keeping these forests alive because an appropriate profitability of oak fruit can promote farmers harvesting this tree or partly preventing its illegal trade as oak wood and charcoal. It is important to mention that production of bread only from oak flour does not have pleasant sensory properties (Matthews, 2016).

On the other side, wheat is the most fundamental grain that supplies the major requirement of human food basket. In Iran, wheat bread and other wheat products constitute the essential part of the diet. In recent years, improvement in nutritional values of wheat bread has been highly interested by mixing wheat flour with different flours that enriches minerals, vitamins, protein and dietary fibres in the final product (Mohammadi, 2007; Abdollahi *et al*., 2008).

In this research, baguettes were produced from a mix of the fruit flour of oak Persica (from Zagros forests) and the wheat flour. The oak flour was used as an additive to wheat flour with different weight ratio. Effects of different amounts of oak flour on physical and chemical properties of baguettes were evaluated using texture, colour, porosity, chemical composition analyses. The sensory properties as an effective parameter in consumer desire was assessed for each product.

Materials and Methods

- *Preparing the Oak flour*

Oak persica from zagros forests was collected in Lordegan oak forest, that is located in Chaharmahal and Bakhtiari province, and was used to produce oak flour. First, peeled and prepared oak, which its outer shell and pair were completely separated from the fruit, was purchased without the reducing the bitterness operations. Oak fruits were placed in cold water for 3 hours and then heated in boiling water for 45 minutes to complete the bitterness reduction process, then exposed to an open air, dried, and finally floured. The baguette was produced in an industrial bakery in Yasuj with the following description. In order to produce the bread, used wheat flour (Setareh, Arde Maran Company, Iran), salt (Sepid Daneh Company, Iran), and Dry-Active-Immediate yeast (Razavi Compyny, Iran). The composition of the baguette ingredients was as follows: three kilograms of wheat flour was mixed with a series of the oak flour (w/w); 180 g (6%), 240 g (8%), 300 g (10%), 360 g (12%), and 420 g (14%). Other ingredients, including 30 g of salt, 50 g of yeast, and 20 g of improver, were added to the wheat/oak flour mixture, and 2400 ml of lukewarm drinking water was slowly added to the mixture. The processing time in the dough machine was 6 minutes.

The paste produced with different oak/wheat flour ratio passed the initial maturation/putting time for 25-30 minutes on the stainless steel table at room temperature. The paste was then formed by rolling machine in the form of a roll to produce baguettes. Except for the 14% oak/wheat flour ratio, all groups were easily rolled with a roller machine and put on special trays to enter the steaming section. Therefore, this step was carried out by hand for the 14 % group. It took 25-30 minutes until the chuckling was carried out and the paste rolls were placed on special trays until the steaming step. The rolled paste was in the hothouse for about 38 minutes and was slowly steamed during this time, which provided the temperature for the yeast growth. The treatments were then placed in the oven at 170-180 ^{o}C for 15 minutes. Although the 14% group underwent the streaming for an extra 10

minutes due to improper enlargement of the paste as compared to other paste groups, no considerable change was occurred in the paste volume for this group. Finally, the baguette process was ended by cooling the breads and packing them individually in the sealed nylons.

- Product properties analysis

The texture analysis was carried out by the CT3 model of Brookfield Engineering Co, Middelboro, USA. We used a one-step test comprising of 50% compression ratio, 20 mm penetration depth, 0.5 mm/s velocity of the water movement, type TA44 probe with a diameter of 4 mm, and the zero holding time. In a two-step test, TPA (texture profile assessment) was conducted in the Laboratory of Food Industry by texture analyser device manufactured by Brookfield Engineering Co, Middelboro, USA CT3 model with a depth of probe penetration of 20 mm (50% compression ratio), a velocity of probe movement of 0.5 mm/s, a probe type TA3/1000, and a zero holding time.

The images for Color and porosity test were taken by Sony W35 camera with a 7.2-megapixel lens in an optical chamber with two 18-watt fluorescent lamps, a 30-degree angle, and a distance of 30 cm from the treatment. Factors l, a, b and colour were evaluated by the Image- Pro plus software (Saricoban and Yilmaz, 2010). Chemical tests were performed according to the testing methods for the wheat flour, Iran's National Standard No. 103. Flavor and smell test were carried out at three different times. The first, sixth, and eighth days, based on the bread quality assessment method of the Grain Research Center of the country and by 15 evaluators who had previously received a basic training for the corresponding test. The durability test was also analysed using the following method: each evaluator examined the treatments and gave a score of 0-5 to the flavor and smell. The bread was assessed based on the following qualitative classification: excellent for score 5, very good for 4.5-4.99 scores, good for 4- 4.49 scores, acceptable for 3-3.99 points, and undesirable for < 3 scores.

- Statistical analysis

The experimental data were analysed using SPSS software, version 18. The experiment was performed in a completely randomized design, followed by a mean comparison using Duncan's multiple test. P-value< 0.05 was considered as a significant level.

Results and Discussion

In this study, a combination of oak flour (from Persica, Zagros forests) and wheat flour was used to evaluate the physical, chemical and sensory properties of baguettes.

- Penetration Test

As shown in Table 1, the penetration rate was not significantly different between the control group, 8, 10, 6 and 12% oak flour (p-value > 0.05). However, the use of 14% oak flour caused a significant difference in penetration as compared to the control group (p-value <0.05).

Increasing the oak flour to 12% did not significantly affect the penetrance of the bread as compared to lower ratios of the oak flour. On the other side, the 14% group had a denser texture compared to other group. No significant difference was observed between shell flexibility in groups 6, 8 and 10%. The results showed that the texture of bread becomes firmer and denser by increasing percentage of oak flour, which is due to its direct relationship with reducing the number of wheat proteins, especially gluten, these results

are consistent with other studies. (Majzoobi *et al*., 2016; Turfani *et al*. 2017).

- ***Texture Profile Assessment***

The evaluation results in 14% treatment could not be measured due to high density, other results are presented in Table 2.

According to the results, the lowest level of hardness in the first stage was related to the control, indicating a very appropriate texture of this treatment. The 14% treatment showed more stiffness than the machine capacity due to high tissue density and lack of proper porosity. Other treatments showed no significant difference, but among them, 10% treatment after the control had the highest quality and the 12% treatment had the highest hardness. Therefore, it seems that by increasing the percentage of oak flour, the amount of force has increased, which is consistent with the results of other studies. (Abdolghafor*et al*., 2011; Siddiq *et al*., 2009). It was found that in the control treatment, according to the results of the first hardness analysis and its comparison, the difference between the first and second hardness was less than other treatments. This indicates the high quality of bread texture and its higher elasticity than other treatments and these analyzes showed that by increasing the percentage of oak flour, the elasticity of bread decreases And because of this, more force was needed in the second hard zone.

In analyzing the cohesiveness factor, the results showed that 14% treatment had a significant difference with other treatments. The control treatment showed a significant difference with all treatments and had the maximum amount. Therefore, the control treatment had the maximum quality among all treatments, while other treatments did not have a significant difference, but, 10% treatment after control had the highest quality and 12% treatment had the lowest quality. In some tests, the factors improved by increasing the percentage of oak flour to 10%, but the quality decreased by increasing the amount of oak flour to more than 10%, which was consistent with the results obtained by Abdul Ghafoor et al. (Abdul Ghafoor *et al.*, 2011).

Table 1. The results for penetration test.

Penetration test*	Treatments
[a]178.3 (±SD)	Control
[a]208.1	6%
[a]196.8	8%
[a]184.6	10%
[a]211	12%
[b]1835.2	14%

* The assessment unit is a gram penetration test

Table 2. The results for texture profile assessment.

Treatments	Hardness $_1$	Hardness $_2$	Cohesiveness	Springiness	Gumminess	Chewiness
Control	[a]780	[a]706.5	[b]0.556	[c]18.14	[a]437.6	[a]77.8
6%	[b]1960.4	[b]1717.9	[a]0.474	[c]18.09	[b]909.1	[b]161.1
8%	[b]2018.6	[b]1750.5	[a]0.465	[b]17.36	[b]944.7	[b]161.3
10%	[b]1807.9	[b]1571.4	[a]0.474	[ab]17.24	[b]853	[b]144.3
12%	[b]2226.2	[b]1913.9	[a]0.430	[a]16.59	[b]953.4	[b]153.9
14%	Error	Error	Error	Error	Error	Error

The examination of springiness showed that the control treatment and treatment 6% had an appropriate springiness state compared to other treatments that It indicated the appropriate porosity of the texture in these two treatments. The results of the analysis indicated that the amount of springiness and the elasticity of these treatments were reduced with increasing the amount of oak flour in treatments. The higher amount of gumminess factor in the foodstuff was, the higher the adhesion status, therefore according to the analysis, the treatment 10% after the control treatment had the highest quality and the treatment 12% had the least quality. The examination of the chewiness also showed that the control treatment needed the least energy to be chewed, and therefore the chewing ability of this treatment was better than others. after that the10% treatment had a higher quality than others .and it seems that in almost all treatments with an increase in the percentage of oak flour to 12%, chewing ability increases in a little, which is consistent with the results of the research by Pastuszka et al. (Pastuszka *et al*., 2012).

- Color test

The color test analysis was examined by extracting three factors a, b and L and the obtained results have been shown in Table 3.

Table 3. The results of treatments color test.

Treatments	a*	b*	L*
Control	-7.909	41.853	81.376
6%	-7.677	46.655	74.517
8%	-9.374	45.254	73.561
10%	-7.435	42.791	74.871
12%	-6.931	45.456	62.904
14%	-10.721	20.565	72.183

The color difference indices were calculated using the mathematical Eq. 1 and 2, the browning index was calculated using Eq. 3 and 4 (Saricoban and Yilmaz, 2010). Analysis of Cavity and transverse porosity of treatments were achieved using image-Pro Plus software to study the porosity ratio in the tested treatments (Table 4 and Table 5).

1. $WI=100-\sqrt{(100-L^*)+a^{*2}+b^{*2}}$
2. $\Delta E=\sqrt{(L_0-L^*)^2+(a_0-a^*)^2+(b_0-b^*)^2}$
3. $BI=\frac{[100\times(X-0.31)}{0.17}$
4. $x=\frac{(a^*+1.75\times L^*)}{(5.645\times L^*+a^*-3.012\times b^*}$

Table 4. Evaluation results of the color test.

Treatments	B index	W index	ΔE
Control	60.58	53.51	0
6%	82.62	46.28	8.37
8%	78.07	46.76	8.64
10%	71.69	49.82	6.58
12%	104.70	40.92	18.84
14%	20.74	63.78	23.35

Table 5. Results of cavities and transverse surface porosity of samples

Average small diameter / large diameter mean	Roundness	Average Diameter	Small Diameter	Large Diameter	Level	Number	Treatment
0.354	4.82±5.95	9.88±7.52	5.30±3.31	14.95±14.22	116.68±225.52	901	Control
0.356	3.35±3.67	8.72±6.62	4.75±2.83	13.34±12.98	87.51±169.41	936	6%
0.336	4.94±11.23	9.63±10.39	5.21±3.91	15.49±22.52	162.61±596.25	694	8%
0.307	5.13±7.89	10.59±9.82	5.17±3.81	16.85±19.54	165.94±366.23	720	10%
0.318	4.81±7.84	10.26±9.40	5.20±3.21	16.31±20.02	160.56±403.36	697	12%
0.304	12.5±38.23	10.76±17.96	6.04±8.54	19.82±42.35	402.13±1441.21	250	14%

- *Browning index*

The examination of the results showed that the browning index was increased by increasing the percentage of oak flour in tested treatments, indicating a darkening of the color in these treatments with an increase in the percentage of oak flour. However, in the treatment 14%, this factor was subject to severe reduction, which can be attributed to the reduction in the amount of heat transfer in the desired bread dough and an increase in density in this bread. The heat transfer was impaired in this treatment by increasing the density of the dough, and the heat was not well transferred to the surface and into the bread, so the treatment showed lower browning index.

- *Whiteness index.*

The results showed that with increasing the percentage of oak flour, the whiteness index decreased in the treatments, but in the 14% treatment, as stated in the browning index, there is a different trend, which can be attributed to an increase in the density of dough in this treatment and to the reduction of heat transfer, which was examined in the browning index.

- Color difference/ΔE

The examination of ΔE in treatments showed that the color difference/ΔE of the treatments was increased with the control by increasing the percentage of oak flour and this color difference was less between treatments zero and 10%, in the 12% sample and In the 14% sample, this difference reaches its maximum. Although in the previous two indicators, the trend in the sample was 14% different from other samples, but in general it can be said that increasing the percentage of oak flour causes color differences and in 14% this subject is more evident.

- Porosity and cavities

The results showed that the number of cavities per unit area decreased with increasing the percentage of oak flour, therefore that this number reached about one quarter of the control treatment in the treatment 14%. However, the number of cavities in other treatments had no significant difference with the control treatment, and the number of cavities were also increased in the treatment 6%. Therefore, it can be concluded that the increase in the percentage of oak flour reduces the number of cavities in the bread, which can lead to a reduction in porosity, which can reduce the porosity and quality of bread.

Examining the data analysis table, it can be concluded that except for 6%treatment for other treatments, the increase in the percentage of oak flour increases the surface of the cavities and the treatment 14% has a maximum surface, but the standard deviation of each treatment is increased with increasing in level of oak flour and shows that although the level increases, the uniformity decreases. Therefore, the 14% treatment had a maximum level but minimum uniformity, but the 6% treatment had a minimum level and maximum uniformity among all the treatments. The control treatment also after 6% treatment showed a minimum level and a maximum of uniformity. It seems that the uniformity of the texture was reduced with the increase in the percentage of oak flour in the treatments and the texture was not good because of the fact that its surface was increased.

The treatment 14% had a maximum mean diameter in the examination of the mean of the large diameter in the data table, indicating that the cavities of this treatment were larger than other treatments. It can be related to the low

number of cavities in this treatment, but considering the obtained standard deviations can be concluded that the large diameter in this treatment has a small uniformity and the cavities have diameters with more non- uniform sizes.

The treatment 6% had the lowest mean of the large diameter in treatments and has the lowest standard deviation, which indicates the uniformity of the distribution and diameter of the cavities in the treatment, and the control treatment after the 6% treatment has the lowest diameter and the lowest standard deviation. Therefore, it can be concluded that the mean of large diameter and also the standard deviation are increased with increasing the percentage of oak flour in treatments, which indicates larger cavities and its high uniformity. Therefore it seems that the texture quality of the treatments is reduced with increasing the percentage of oak flour because, in addition to the large diameter of the cavities, uniformity and number also has a significant effect on the texture quality.

The discussion of the average small diameter and the average diameter of cavities in the samples, according to the data analysis table, is like to the discussion of the average large diameter.

The examination of the factor (dividing a small diameter to a large diameter) can indicate roundness and a same shape of the cavities in different treatments, and the closer the number is to one, the more roundness and uniformity. Therefore, according to the data table, the 6% treatment has the highest value, which indicates a higher roundness and higher uniformity of the cavities in this treatment, and The treatment of 14% had a minimum value, which indicates that its cavities are non-uniform and less round. After 6% sample, the control sample has the highest roundness and uniformity of cavities among other samples. It seems that the amount of roundness and uniformity is decreased with increasing the percentage of oak flour in the treatments and hence will have a negative effect on the texture quality. Therefore, it can be stated that an increase in the percentage of oak flour reduces the number of cavities, increases the standard deviation, and reduces the same shape and the quality of the bread.

- Sensory and chemical test

The results of the chemical test on flours are presented in Table 6 and results of the examination of the flavor and smell factor was presented in Table 7.

Table 6. The results of the chemical test of flour treatments

Treatment	Humidity	Protein	Ash	Gluten	Fat	Sucrose	Reducing sugars
Control	14.2	10.6	0.55	28	-	-	-
6%	13.4	9.8	0.57	24.5	-	-	-
8%	13.47	9.68	0.6	24.3	-	-	-
10%	13.43	9.65	0.61	24.1	-	-	-
12%	13.24	9.6	0.62	24	-	-	-
14%	13	9.42	0.64	23.5	-	-	-
Oak Flour	8.7	3.9	1	0	7.59	3.3	1.6

Table 7. The qualitative scores on flavor and taste in three days

Treatments	First day	Sixth day	Eighth day
Control	4.93	4.26	3.83
6%	4.93	3.92	3.50
8%	4.66	3.91	2.91
10%	4.60	3.67	2.42
12%	4.50	3.48	2.67
14%	2	1.56	0.8

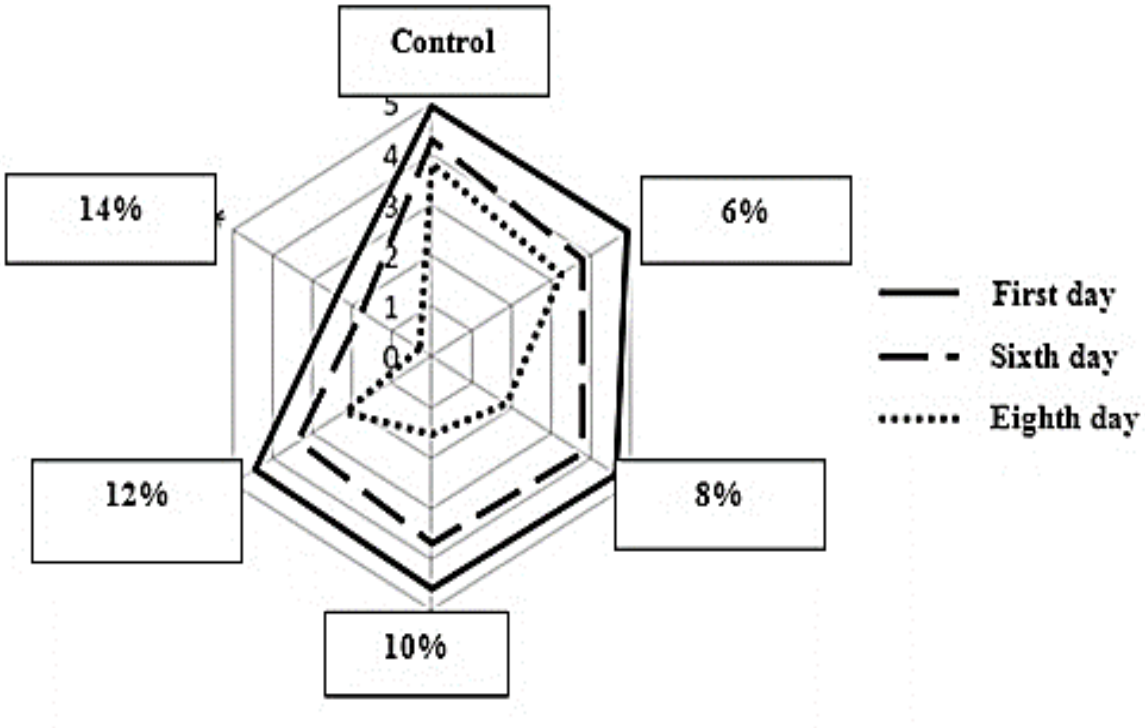

Fig. 1. The examination of the flavor and smell of the treatments during different days.

This factor is the most important factor of this assessment that is examined and can affect other factors. If bread is evaluated unfavorable in this factor, even it has a high score in other factors, it is still not usable.

According to Figure 1 and Table 7, on the first day, all treatments were evaluated as desirable. The decreasing trend of treatments was low with an increase in the percentage of oak flour, Therefore the control treatment and the treatment 6% achieved the same score, on the sixth day, all treatments were able to use, and except for a control treatment that achieved a high score, other treatments were acceptable and had a close score. On the 8th day, other treatments were specified to be unusable with the exception of the control treatment and treatment 6%. Although the control sample and 6% did not score high, it seems that in addition to increasing the percentage of oak flour, increasing the shelf life also affects the decline in bread quality, which is consistent with the results of research by Morteza Mashayekh *et al*. (Mashayekh *et al*., 2008).

Conclusion

In the penetration test, the quality of the bread was dropped with the increase in the percentage of oak flour, which this trend was confirmed by TPA test. The browning index had an increasing trend due to more hardness of the texture and the inappropriate density. In the color test, whiteness test results showed the decreasing trend that was due to the dark color of the oak flour. In the examination of cavities and porosity, by increasing percentage of oak flour the number of cavities per unit area was decreased, but the non-uniformity in the treatments was increased. The sensory properties that are the main factor in the consumption of food had a decreasing trend by passing the time and also an increase in the percentage of oak flour. The results showed that on the

eighth day, the treatments lost their ability to consume. Therefore, according to these results, it is possible to increase the percentage of oak flour to 12% for consumers, but the quality of bread decreases.

Therefore, addition of oak flour to wheat flour to produce bread as the main cereals product in Iran is significantly possible. The product not only can help wheat bread to be healthier and richer but also can reduce bread cost because of abundance of oak trees and easy harvesting. In addition, wheat / oak bread production can save Zagros forests from fire and logging.

References

Abdolghafor, R. F., Mustafa, A. I., Ibrahim, A. M. H. & Krishman, P. G. (2011). Quality of Bread from composite Flour of sorghum and Hard White Winter Wheat. AdvanceJournal of Food Science and Technology, 3(1), 9-15.

Abdollahi, Z., Elmadfa, I., Djazayeri, A., Sadeghian, S., Freisling, H., Salehi Mazandarani, F. & Mohamed, K. (2008). Folate, vitamin B12 and homocysteine status in women of childbearing age: Baseline data of folic acid wheat flour fortification in Iran. Annals of Nutrition and Metabolism, 53(2), 143-150. https://doi.org/10.1159/000170890

Hosseini, A., Hosseini, S. M., Juan, C. & Linares, J. C. (2017). Site factors and stand conditions associated with Persian oak decline in Zagros mountain forests. Forest System, 29(3), 1-13. https://doi.org/10.5424/fs/2017263-11298

Mashayekh, M., Mahmoodi, M. R. & Entezari, M. H. (2008). Effect of fortification of defatted soy flour on sensory and rheological properties of wheat bread. International Journal of Food Science and Technology, 43(9), 1693-1698. https://doi.org/10.1111/j.1365-2621.2008.01755.x

Matthews, W. (2016). Humans and fire: Changing relations in early agricultural and built environments in the Zagros, Iran, Iraq. Anthropocene Review, 3(2), 107-139. https://doi.org/10.1177/2053019616636134

Mohammadi, I. M. (2007). Factors influencing wheat, flour, and bread waste in Iran. Journal of New Seeds, 8(4), 67-78. https://doi.org/10.1300/J153v08n04_05

Nedamani, E. R., Mahoonak, A. S., Ghorbani, M. & Kashaninejad, M. (2014). Evaluation of antioxidant interactions in combined extracts of green tea (Camellia sinensis), rosemary (Rosmarinus officinalis) and oak fruit (Quercus branti). Journal of Food Science and Technology, 52(7), 4565-4571. https://doi.org/10.1007/s13197-014-1497-1

Nedamani, E. R., Mahoonak, A. S., Ghorbani, M. & Kashaninejad, M. (2014). Antioxidant properties of individual vs. combined extracts of rosemary leaves and oak fruit. Journal of Agriculture Science and Technology, 16, 1575-1586. http://jast.modares.ac.ir/article-23-6285-en.html

Pastuszka, D., Gambus, H., Ziobro, R., Mickowska, B., Buksa, K. & Sabat, R. (2012). Quality and Nutritional value of wheat bread with a preparation of oat proteins. Journal of Microbiology, Biotechnology and Food Science, 1, 980-987

Pourreza, M., Hosseini, S. M., Sinegani, A. A. S., Matinizadeh, M. & Alavai, S. J. (2014). Herbaceous species diversity in relation to fire severity in Zagros oak forests, Iran. Journal of Forestry Research, 25 (1), 113-120. https://doi.org/10.1007/s11676-014-0436-3

Sadeghi, S. (2009). Iranian oak galesh bees. Forestry and Rangeland Research Institute of Iran, Tehran.

Saricoban, C. & Yilmaz, T. M. (2010). Modelling the effects of processing factor on the changes in colour parameters of cooked Meatballs using response surface methodology. World Applied Science Journal, 9(1), 14-22

Sharifi, Z., Azadi, N. & Certini, G. (2017). Fire and Tillage as Degrading Factors of Soil Structure in Northern Zagros Oak Forest, West Iran. LDD, 28(3), 1068-1077. https://doi.org/10.1002/ldr.2649

Siddiq, M., Nasir, M., Ravi, R., Butt, M. S., Dolan, K. D. & Harte, J. B. (2009). Effect of defatted maize germ flour addition on the physical and sensory quality of wheat bread. LWT- Food Science and Technology, 42(2), 464-470. https://doi.org/10.1016/j.lwt.2008.09.005

Turfani, V., Narducci, V., Durazzo, A., Galli, V. & Carcea, M. (2017). Technological, nutritional and functional properties of wheat bread enriched with lentil or carob flour. LWT- Food Science and Technology, 78, 361-366. https://doi.org/10.1016/j.lwt.2016.12.030