Turkish Journal of Food and Agriculture Sciences

5(2): 88-93 (2023)

Research Article

DOI: https://doi.org/10.53663/turjfas.1380536

THE EFFECTS OF HAZELNUT PULP ADDING ON SENSORIAL PROPERTIES OF TARHANA

Zekai TARAKÇI[1]* , Merve Nur OĞURLU[2]

[1] Ordu University, Faculty of Agriculture, Department of Food Engineering, Ordu-Türkiye

[2] Ordu Provincial Directorate of Agriculture, Ordu-Türkiye

ARTICLE INFO

HISTORY

Received: 24 October 2023
Revised: 14 November 2023
Accepted: 14 November 2023
Online Published: 30 December 2023

KEYWORDS

Hazelnut pulp
Sensorial properties
Tarhana

*CONTACT

ztarakci@odu.edu.tr

A B S T R A C T

In this study, hazelnut pulp added to tarhana to increase its nutritional properties and create a new product. For this purpose, cold-pressed partially defatted hazelnut pulp obtained and added to the tarhana formulation at certain rates of 0%, 5%, 10%, 15%, 20%, 25% and 30%. Sensory tests carried out to measure the liking of tarhana with hazelnut pulp, a new product. In the sensory evaluation, all samples examined in terms of odor, color, taste-aroma, consistency, and general acceptability. Because of the sensory analysis carried out by cooking tarhana in the form of soup, it observed that there was no significant difference between the control group and the tarhana with hazelnut pulp in terms of color, smell, consistency, taste, aroma and general acceptability. However, when the sensory analysis results are examined, it is seen that tarhana with hazelnut pulp received higher scores than the control group.

Citation: Taraçı, Z., & Oğurlu, M.N. (2023). The effects of hazelnut pulp adding on sensorial properties of tarhana. *Turkish Journal of Food and Agriculture Sciences*, *5*(2), 88-93.

ORCİD> 0000-0002-3828-3232 (ZT), ORCİD> 0000-0002-7732-2484 (MNO)

1. Introduction

Tarhana varies depending on its raw material, the materials used in its production and the variability of production methods. Tarhana, which is generally dried and powdered, preserved fresh in some regions without being dry, while in some regions, it dried as chips and consumed as a snack. Fermented foods are reliable products; taste and aroma constitute another factor to be consumed (Dağlıoğlu, 2000). Fermented foods produced in comparison with the ingredients in their compositions are nutrients that had a long shelf life with their nutritional and sensory properties (Gotcheva et al., 2001). Bilgiçli et al. (2014) examined the effects of yeast (*Saccharomyces cerevisiae*), malt flour and phytase enzyme preparation on some nutritional parameters and phytic acid amount of tarhana and stated that the mineral content and protein bioavailability of tarhana are very high and tarhana is natural. It seen that the fermentation process is sufficient in this regard and the effects of yeast, malt and phytase are limited. Gökmen (2009) investigated the effects of adding quince to tarhana and it found that the use of raw quince in making tarhana more accepted, it is also a product that has good mineral value and high protein value. Tarakçı et al. (2013) investigated the effect of blackberry substitution on some functional and physicochemical properties of tarhana and concluded that there was a decrease in acidity, dry matter, water retention capacity, foaming capacity and foam stability in tarhana with the addition of blackberry. In viscosity measurements, they determined that viscosity decreased with increasing temperature for all samples. In the study conducted by Çağlar et al. (2013), the possibilities of using carob in tarhana were investigated and it was determined that the addition of carob flour positively affected the amount of mineral substances in tarhana and gave better results in terms of functional properties. Even if a small amount of carob flour, such as 3%, added to tarhana, it was determined that consumers preferred the product in terms of taste, color and smell. Some of these include the formulation of tarhana was found to be a product suitable for enrichment with various foods. In this study, tarhana enriched for nutritional, sensory, and structural enrichment (Tarakçı et al., 2013). As fruit additions, cranberry (Koca et al., 2006), quince (Gokmen, 2009), and carob (Herken and Aydin, 2015) have been used. The goal of this study was to produce a new type of tarhana by hazelnut pulp and to adding tarhana with nutritional, sensory, functional, aroma, and structure properties. In addition, hazelnut is an undeniable fact that the benefits to human health in the food industry as a side component aimed to evaluated in a different field.

2. Material and methods

For the production of tarhana samples, wheat flour, yoghurt, tomato paste, fresh yeast, mint, red pepper, tomato, salt and hazelnut samples purchased from the market in Ordu city. Physical, chemical and sensory analyzes were carried out in the Food Engineering Laboratories of Ordu University Faculty of Agriculture. Tarhana varieties produced in three replicates. Preparation of hazelnut; natural hazelnuts from the Ordu province market were first broken down and divided into smaller pieces in a food processor. In the cold pressed oil extraction machine, the hazelnut oil rate reduced. The pulp hazelnut ground in a food processor, divided into smaller pieces, and made ready for additional use.

Tarhana samples production: In the study, 0% (FK), 5% (F5), 10% (F10), 15% (F15), 20% (F20), 25% (F25), and 30% (F30) hazelnut pulps added to tarhana samples. For each tarhana sample, 500 g wheat flour (50%), 250 g yoghurt (25%), 120 g onion (12%), 60 g tomato paste (6%), 40 g salt (4%), 10 g fresh yeast (1%), 10 g red pepper (1%), and 10 g dry mint (1%) were added. While the hazelnut ratio increased in the product formulations, the amount of the other inputs kept constant. Before chopping the onions in the food processor, tomato paste, dried mint, red pepper, salt added, and a mixture obtained. After the mixture was pre-baked, water added and then cooked for a while. When the temperature of the obtained mortar decreased to 20°C, flour, yoghurt, yeast, and hazelnuts added. Kneaded for 10 minutes to ensure homogeneous dough structure. The prepared tarhana doughs allowed fermenting for 30 hours at 30°C. Fermented tarhana doughs brought into hazelnut-sized pieces on the drying tray. The fermented tarhana doughs dried in a fan oven (Nucleon, NST-120, Ankara) at 52°C until the moisture content was 12%, ground, and pulverized.

Sensory analysis tarhana samples: Sensory analysis performed in accordance with the study, 100 g Tarhana sample, 1.5 L distilled water, 40 g oil, 10 g salt were mixed and the mixture is cooked in the steel pot at medium heat for 5 minutes after stirring.

The cooked samples kept in an oven at 60°C and presented to the panelists in porcelain bowls. Faculty members and students (5 males, 5 females) served Tarhana soups from the Faculty of Agriculture who were between the ages of 20-40 years old and had no obstacles to sensory testing; color, odor, consistency, taste-aroma, and general acceptability evaluated using the sensory (Şensoy and Tarakçı, 2023).

Statistical Analysis: One-way ANOVA method used with Minitab 18 package program for statistical analysis of the data of the analysis results of Tarhana samples with hazelnut addition. Tukey multiple comparison test used to compare the samples, which found to be significant because of variance analysis.

3. Results and Discussion

Sensory properties in tarhana samples

Substances added while enriching the nutritional value of foods should cause no or little change in their sensory properties, and should not contradict consumer habits (Eyidemir, 2006). Sensory tests carried out to determine the sensory properties of the soups prepared from tarhana samples and to measure the degree of appreciation of the panelists, especially the tarhana with the addition of hazelnut pulp, which is a new product. For sensory testing, tarhana soups, are cooked for 10 minutes and then served in porcelain bowls to a group of 10 panelists at 60°C. Tarhana, it was evaluated separately by a group of 10 panelists out of a total of 10 points (1, very bad, 10, excellent) in terms of five features: color, smell, consistency, taste-aroma and general acceptability.

Table 1. Comparison of the values of sensory properties in Tarhana soups (1-10 Scores)*

Hazelnut ratio (%)	Colour	Smell	Consistency	Taste-Aroma	General Acceptability
FK	6.90±2.08a	6.80±2.20a	7.10±2.33a	5.90±1.97a	6.50±1.72a
F5	7.40±1.27a	7.50±1.43a	7.40±1.65a	7.20±1.32a	8.10±0.99a
F10	7.70±1.06a	8.10±1.29a	7.50±1.51a	7.70±1.77a	7.00±1.83a
F15	7.70±1.42a	7.30±1.95a	7.80±1.69a	7.70±1.77a	7.20±1.62a
F20	6.60±1.90a	7.30±2.31a	7.40±2.22a	7.00±2.79a	6.80±2.49a
F25	7.30±1.57a	8.00±1.70a	7.80±1.03a	8.00±1.25a	7.60±1.78a
F30	7.00±1.70a	7.60±1.96a	7.50±1.18a	8.00±1.76a	7.90±1.85a

*There is a significant difference between the letters in the same column ($p<0.05$).

Color scores of tarhana soups

The substances to be added, during the enrichment of the nutritional value of the food should make no or very little change in the sensory properties of the food, and this change should not contradict the consumer habits. The panelists to assess the level of appreciation carried it out. Variance analysis conducted for color evaluation for Tarhana soups. The effect of hazelnut pulp ratio not found to be significant, according to the results. Given that the odor scores of all tarhana with other substitution rates are higher than the control group, it concluded that hazelnut pulp substitution increases odor admissibility. Table 1 shows the variance analysis results for color evaluation for tarhana soups. According to the results, the effect of hazelnut pulp ratio not found to be significant ($p>0.05$). When the color values, a feature analyzed during the panel test, examined, it was determined that there was no statistically significant difference between the tarhana ($p>0.05$). It observed that the lowest color score belonged to the tarhana with 20% hazelnut pulp, with an average of 6.60±1.90, and the highest scores, 7.70±1.06 and 7.70±1.42, belonged to the tarhana with 10% and 15% hazelnut pulp substitution, respectively (Table 1). While the panelists liked the red color formed with the addition of 10-15% hazelnut, the panelists did not like pulp, the red color intensity formed with increasing amounts (20-25-30%).

Smell scores of tarhana soups

Table 1 shows the variance analysis results for the odor evaluation of tarhana soups. According to the results, the effect of hazelnut pulp ratio was not statistically significant ($p>0.05$). However, the lowest odor value found in the control group tarhana produced without the addition of hazelnut pulp (0%), with an average of 6.80±2.20.

The highest odor value, 8.10±1.29, seen in tarhana prepared with the addition of 10% hazelnut pulp (Table). According to these data, it seen that the most popular tarhana in terms of smell are those with 10% hazelnut pulp replacement. Considering the fact that the odor scores of all tarhana using other substitution rates (5, 15, 20, 25, and 30%) are higher than the control group, it be said that the hazelnut pulp substitution increases the acceptability in terms of odor. Şensoy and Tarakçı (2023) found that almond pulp added to tarhana resulted in similar color, smell, consistency, taste and aroma. When the consistency scores of panelists tarhana soups examined. The effect of hazelnut pulp ratio was not statistically significant in the taste-aroma and general acceptability scores.

Consistency scores of tarhana soups

The variance analysis results of the consistency evaluation for tarhana soups given in Table 1. When the consistency scores of the panelists' tarhana soups were examined, it was seen that there was no statistical difference between the tarhana ($p>0.05$). One of the features evaluated in the sensory panel was determined as consistency. Multiple comparison test results for hazelnut pulp ratios shown in Table 1. The lowest score seen in control tarhana with 7.10±2.23, while the highest score seen in tarhana with 15% and 25% hazelnut pulp added, with 7.80±1.69 and 7.80±1.03, respectively. The consistency scores of all tarhana in which other substitution rates used are higher than the control group, it said that the hazelnut pulp substitution increases the acceptability in terms of consistency. Tarakçı et al. (2004) investigated the use of corn flour and whey in tarhana and found that it was compatible with sensory values in their study.

Taste-aroma scores of tarhana soups

Variance analysis results of taste-aroma evaluation for tarhana soups shown in Table 1. The effect of hazelnut pulp ratio in determining the taste-aroma sensation was not found to be statistically significant ($p>0.05$). Multiple comparison test results for taste-aroma evaluation for hazelnut pulp ratios given in Figure 1. Because of the test, the control group tarhana produced without the addition of hazelnut pulp (0%) had the lowest taste-aroma value of 5.90±1.97, while the tarhana prepared with the addition of 25% and 30% hazelnut pulp had the highest taste-aroma value of 8.00±1.25-8.00±1.76. Again, the scores of the tarhana with 5, 10, 15 and 20% hazelnut pulp substituted at the end of the sensory test were higher than the control tarhana, and it said that the hazelnut pulp substitution increased the acceptability in terms of taste and aroma. Since tarhana is a fermented food, an important element that determines its taste is the formation of lactic acid based on lactic acid fermentation. In fact, the tarhana sample with 30% hazelnut pulp, which received the highest score in terms of taste, is also the sample that showed the highest acidity development.

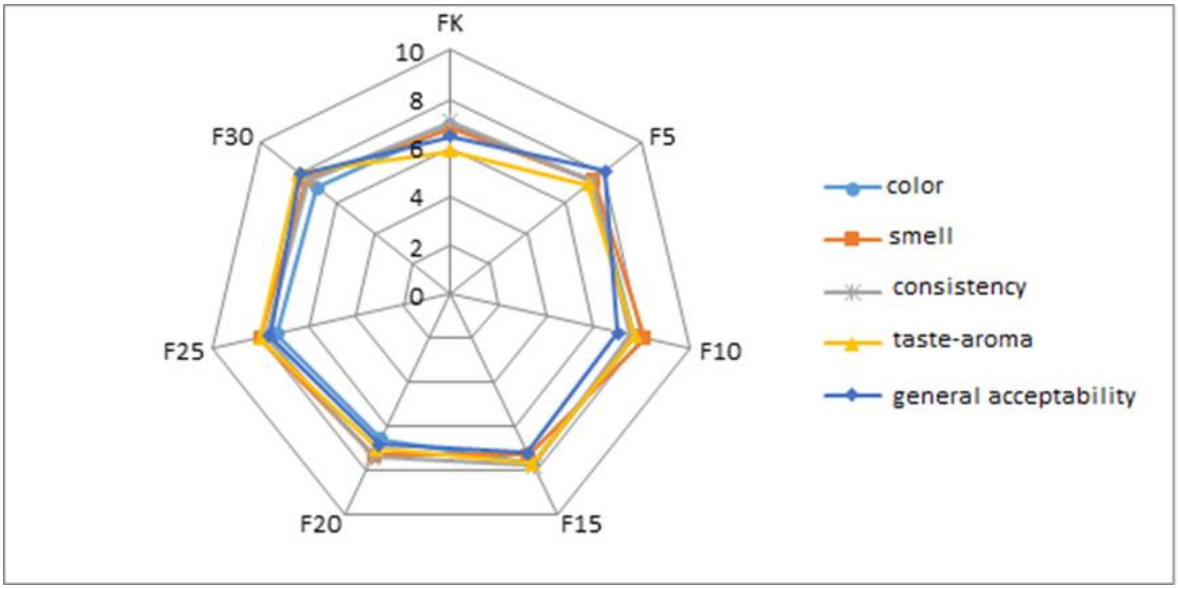

Figure 1. Sensory analysis results on tarhana samples

The sensory analysis carried out by cooking tarhana in the form of soup; it observed that there was no significant difference between the control group and the tarhana with hazelnut pulp in terms of color, smell, consistency and taste-aroma. However, when the sensory analysis results are examined, it is seen that tarhana with hazelnut pulp obtained higher scores than the control group.

General acceptability scores of tarhana soups

The variance analysis results for the general acceptability feature, which is included last in the sensory test form, given in Table 1. According to the results, the effect of hazelnut pulp was not found to be statistically significant ($p>0.05$). The multiple comparison test results of the general acceptance scores obtained in the sensory evaluation given in Table 1. While the lowest general acceptance score seen in the control group tarhana with 6.50±1.72, it observed that the tarhana prepared with 5% hazelnut pulp substitute had the highest general acceptability score with 8.10±0.99. It seen that the panelists with a rating of 7.90±1.85 liked the tarhana with 30% hazelnut pulp, after the tarhana with 5% hazelnut pulp. Considering the sensory analysis results in the light of these data, it is seen that tarhana with hazelnut pulp obtained higher scores than the control group. Actually, the scores obtained at the end of the sensory test are higher than the control tarhana, and it said that the hazelnut pulp substitution increases the acceptability of the tarhana. Tarhana is a fermented food; lactic acid formation based on lactic acid fermentation is an important factor in determining its flavor. When the sensory analysis results taken into consideration in the light of these data, it seen that hazelnut pulp added tarhana received higher scores than the control group. It said that hazelnut pulp substitution increases the acceptability of tarhana when the scores obtained at the end of the sensory test are higher than the control tarhana.

When some studies examined, various flours such as barley flour, quinoa flour, and corn flour, which substituted in certain proportions instead of wheat flour, used in tarhana production, and these products received low scores in terms of general acceptability (Erkan et al., 2006; Üçok et al., 2019; Anıl et al., 2020). However, wheat flour used in this study and no other flour substituted in the formulation. For this reason, it estimated that almonds have a positive effect on increasing general acceptability.

4. Conclusion

Hazelnut is the hard-shelled fruit with the most widespread cultivation area in the world after almonds, and Türkiye ranks first in the world in hazelnut production and export. For this reason, defatted hazelnut pulp was added to tarhana, our traditional product that has been produced in Türkiye and around the world from past to present, in certain proportions and its production was carried out in a laboratory environment. Because of the sensory analysis carried out by cooking tarhana in the form of soup, it observed that there was no significant difference between the control group and the tarhana with hazelnut pulp in terms of color, smell, consistency, taste, aroma and general acceptability. However, when the sensory analysis results are examined, it is seen that tarhana with hazelnut pulp received higher scores than the control group. In addition, new products created by adding a different flavor to tarhana soup, which is one of our traditional products. It has also been shown that products with high added value can be produced by using hazelnuts in tarhana, which we have more than half of the world's production.

Compliance with Ethical Standards

Conflict of Interest

The authors declare that they have no conflict of interest.

Authors' Contributions

Zekai TARAKÇI: Methodology, Investigation, Conceptualization, and Writing - original draft, Visualization; **Merve Nur OĞURLU**: Formal analysis, Data curation, Statistical analysis.

Ethical approval

Not applicable.

Funding

No financial support was received for this study.

Data availability

Not applicable.

Consent for publication

Not applicable.

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