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Research Article

Sızgıt as a Traditional Food of Cappadocia: Differences in Traditional and Commercial Production

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Abstract

Sızgıt which is consumed likely and frequently a traditional meat product producing by Cappadocian people. This study aims to determine the physicochemical and microbiological properties of traditional and commercial *Sızgıt*. pH, lipid oxidation and cholesterol level, protein, fat and moisture content, fatty acid composition, aerobic mesophilic bacteria, enterobacteria, mold and yeast, *Staphylococcus aureus* and *Salmonella* counts were determined. Fat and cholesterol content of traditional samples had lower than the commercial samples while the protein content of commercial samples had highest (P<0.05). Saturated fatty acid levels of traditional samples were higher than commercial samples (P<0.05). The highest lipid oxidation values were determined in traditional samples. *Salmonella* and *S. aureus* which are pathogenic bacteria were not determined in both types of *Sızgıt* samples. The results indicated that the public should be informed about food safety and the sensitivity to the production and consumption of these products should be increased. On the other hand, ethnic and traditional characteristics on the production and the storage conditions of the *Sızgıt* in Cappadocian should be preserved.

Key words: *Sızgıt*, Meat product, physicochemical properties, microbiological properties.

Geleneksel Bir Kapadokya Ürünü *Sızgıt*: Geleneksel ve Ticari Üretimdeki Farklılıklar

Özet

Sızgıt sıkça ve sevilerek tüketilen, Kapadokya halkı tarafından üretilen geleneksel bir et ürünüdür. Bu çalışmanın amacı geleneksel ve ticari olarak üretilen *Sızgıt*'ın fizikokimyasal ve mikrobiyolojik özelliklerinin belirlenmesidir. Çalışma kapsamında pH, lipid oksidasyonu ve kolesterol düzeyi, protein, yağ ve nem içeriği, yağ asidi kompozisyonu, toplam aerobik mezofilik bakteri, enterobakter, maya ve küf sayıları, *Staphylococcus aureus* ve *Salmonella* sayıları tespit edilmiştir. Geleneksel olarak üretilen *Sızgıt* örneklerinin yağ ve kolesterol içeriği ticari olarak üretilen örneklerden daha düşük iken, protein içeriği daha yüksek tespit edilmiştir (P<0.05). Geleneksel olarak üretilen örneklerin doymuş yağ asidi içerikleri ticari olarak üretilen örneklerden daha yüksektir (P<0.05). En yüksek lipid oksidasyonu değerleri geleneksel örneklerde tespit edilmiştir. Patojen bakteriler olan *Salmonella* ve *S. aureus* örneklerde tespit edilmemiştir. Sonuçlar halkın gıda güvenliği konusunda ve bu ürünlerin üretimi ve tüketimi konusunda bilinçlendirilmesi gerektiğini göstermektedir. Öte yandan, Kapadokya'da üretilen Sızgıt'ın üretim ve depolanma koşullarındaki etnik ve geleneksel özellikler korunmalıdır.

Anahtar kelimeler: *Sızgıt,* et ürünü, fizikokimyasal özellikler, mikrobiyolojik özellikler.

Introduction

Turkish cuisine beginning with Central Asia and extends to the Seljuks and the Ottoman Empire which spread over three continents. At the end of centuries, the Turks were settled in Anatolia (Batu and Batu, 2018). They were influenced by many societies during the years of nomadic life and in the settled life. Therefore, they possess a rich culinary culture. And also, Cappadocia is located on the central Anatolia plateau within a volcanic landscape sculpted by erosion to form a succession of mountain ridges, valleys and pinnacles known as "fairy chimneys" or hoodoos. It has the remains of a traditional human habitat dating back to the 4th century. One of the characteristics of Cappadocia is having plenty of a hundred underground cities and settlements. The underground cities, which are guessed to be used since the Bronze Age, used to be a settlement mostly in the Byzantine period, doubtless. In this period, increasing invasions forced local residents to build underground cities for protection and religious purposes (UNESCO, 2018). Additionally, underground warehouses which are the most common rock-hewn structures and generally used for storing potatoes and citrus fruits for climate condition advantages nowadays have been an important place for ripening and storage of foods for ages (Özata and Arun, 2018). The average relative humidity (%70-95) and temperature (4-10 °C) of underground warehouses are optimum for the storage of these products (Canan *et al.*, 2015). Furthermore, Cappadocia has also a unique and old pottery culture which significantly affecting its gastronomical history. Pottery and other kitchen utensils are traditionally made in the region since the first Bronze Age. These utensils have used for preparation and storage of foods for a century (Kaymakçı, 2011).

Sızgıt made from beef meat and fat is a traditional cuisine and meaning of the *Sızgıt* is long-lasting and durable dry meat among the Cappadocian people, and it is produced from cattle meat slaughtered before winter months (October-November) or on the eid of qurban which is religious holidays of Muslims. The prepared products meet the meat needs of the family during the whole winter season. Briefly, *Sızgıt* prepared as follows; cattle meat is minced as meat cubes and stir-fried with animal fat. Then, stir-fried meats are filled into pottery when meat is hot. The top of the pot is covered with a thick layer of melted animal fat. And then, pottery is stored in underground warehouses until consumed (Narin, 2001). In this way, people have developed a storage method with special facilities provided by the region they live in for meat which is a very valuable product as well as revealed a significant traditional and ethnic cuisine. *Sızgıt* is produced with different names such as "*Sığtıt", "Sıygıç", "Sızkıt", "Sızgıç, "Sısgıt"*or *"Sızkuç"* in the other settlements of Anatolia.

Sızgıt is stored in natural warehouses offering convenient conditions for storage throughout the whole winter. It can be consumed alone but is usually consumed by added into other foods. Legumes and cereals are more consumed in the region due to geographic reasons. Therefore, *Sızgıt* also participates in dishes made from legumes such as beans and chickpeas.

This unique product is currently produced and consumed in the same way in Cappadocia. Its production in the original form is carried out only by the people living in rural areas and with low-income levels. However, in the cities, *Sızgıt* is produced in a similar way by butchers and markets and it is commonly sold in single-use containers at refrigerator temperature. This situation creates significant differences in the chemical and microbiological properties of *Sızgıt*. The main objective of this research was to evaluate *Sızgıt* produced traditionally and commercial in terms of public health and nutrition. This study aims to determine the physicochemical properties (pH, lipid oxidation and cholesterol level, protein, fat and moisture content, fatty acid composition) and microbiological properties (aerobic mesophilic bacteria, enterobacteria, mold and yeast, *Staphylococcus aureus* and *Salmonella* counts) of the *Sızgıt*.

Material and Methods

Sızgıt samples produced traditionally and commercially were collected from local people and markets, respectively. 6 traditional *Sızgıt* samples and 7 commercial *Sızgıt* samples were collected for each of 3 replications on the separate batch.

pH and chemical composition

The pH values, fat, protein, ash and moisture content of *Sızgıt* were determined as described by (AOAC, 2005).

Cholesterol content

Total cholesterol content of *Sızgıt* samples was determined as described by Rudel and Morris (1973).

Lipid oxidation

Thiobarbituric acid reactive substances (TBARS) were determined for evaluation of oxidative stability. TBARS values of the samples were determined as described by Kilic and Richards (2003). Results were presented as µmol TBARS / kg *Sızgıt*.

Fatty acid composition

Fatty acid composition analysis in *Sızgıt* samples were determined as described by Ozer and Kilic (2015). Fatty acids were identified by retention time and compared with standards of fatty acid methyl esters (FAME Mix, CRM47885, Sigma-Aldrich Inc., Oakville, ON) and were reported as % fatty acids.

Microbiological analysis

Sızgıt samples (10 g) were aseptically weighed, added to sterile buffered peptone water (90 ml) and homogenized in a stomacher at room temperature. Decimal dilutions in buffered peptone water were prepared and duplicate 0.1 ml samples of appropriate dilutions were spread on the following media; Plate Count Agar (Merck, Darmstadt, Germany) for total viable aerobic count (TVAC), incubated at 30 °C for 48 h; Baird Parker Agar with egg yolk (Merck, Darmstadt, Germany) for *S. aureus* count, incubated at 30 °C for 48 h; Potato Dextrose Agar (Merck, Darmstadt, Germany) for yeast and molds, incubated at 25 °C for 72 h; Violet Red Bile Agar (Merck, Darmstadt, Germany) for Enterobacteriaceae, incubated at 37 °C for 48 h; Bismuth Sulfite Agar (Merck, Darmstadt, Germany) for Salmonella, incubated at 37 °C for 48 h.

Statistical analysis

The results were expressed as mean values with standard errors from the three replications of each sample. The statistical evaluation of the results was performed using the SPSS 22.0.0 (SPSS Inc., Chicago, USA). Data collected for physicochemical and microbiological properties of *Sızgıt* were analyzed by independent samples t-tests for comparison of means. The decision rule the rejection of the null hypothesis at the 5% or lower level of significance.

Results and Discussion

The physicochemical composition of traditional and commercial *Sızgıt* present in Table 1. No differences in the physicochemical composition of *Sızgıt* among the traditional and commercial production except fat, protein and cholesterol content were determined. pH values for traditional and commercial *Sızgıt* ranged from 6.04 to 6.31, however, average pH values were similar level for traditional and commercial. In addition, moisture and ash content for traditional and commercial samples were determined as similar levels. However, fat and cholesterol content of commercial samples had higher than the traditional samples while the protein content of traditional samples had the highest (P<0.05). It is thought that these results are related to the ratio of meat and fat in the *Sızgıt* formulation. High fat and cholesterol content of *Sızgıt* are a very important risk for human health. And also, it is a significant disadvantage from a nutritional point of view.

Table 1. Physicochemical composition of Sızgıt

Physicochemical composition	Traditional *Sızgıt*	Commercial *Sızgıt*
pH	6.14±0.30 [a]	6.21±0.16 [a]
Fat (%)	21.44±0.26 [b]	32.48±1.56 [a]
Moisture (%)	48.90±0.74 [a]	48.49±1.24 [a]
Protein (%)	26.77±0.27 [a]	24.30±1.08 [b]
Ash (%)	2.87±0.18 [a]	2.69±1.01 [a]
Cholesterol (mg/100 g)	174.68±2.45 [b]	197.38±3.05 [a]

a-b (→) Different letters within a row are significantly different (P<0.05).

Fatty acid compositions of *Sızgıt* were presented in Table 2. The fatty acids contents of *Sızgıt* have significantly changed the production type as commercial and traditional (P<0.05). The main reason for the differences is the fact that differences in the fat content of commercial and traditional types. Results revealed that the commercial *Sızgıt* had higher palmitic and stearic acid levels than traditional samples (P<0.05). However, traditional *Sızgıt* also had the highest values of unsaturated fatty acids which are oleic and palmitoleic acid levels (P<0.05). Furthermore, SFA and PUFA levels of traditional samples were higher and lowest than commercial samples, respectively (P<0.05). However, PUFA were at a similar level for both types of products. As a result of these changes in fatty acids content, the SFA/UFA ratio for commercial samples was higher than traditional (P<0.05). According to the current nutritional recommendations, SFA/UFA ratio should be below 1.0 and both type samples are quite above this level (de la Santé, 2016).

Sızgıt samples have stored for long periods that can be all winter season at underground warehouses by local people. Similarly, commercial samples also under similar threat because of high animal fat content even if it is stored in better conditions and consumed quickly. Lipid oxidation during this storage is an important threat both for food safety and human health. TBARS analysis

results showed that there were significant differences in TBARS values of traditional and commercial samples (Table 3). Results revealed that the highest TBARS values were determined in traditional samples (P<0.05). However, the results were also showed that TBARS values for some commercial and traditional samples were at the same level. This situation is completely related to the fat content and storage conditions and duration of the products. On the other hand, the lipid oxidation levels of the products offered to people's consumption are quite high in all conditions. This situation is a very important risk for human health.

Table 2. Fatty acid composition of Sızgıt

Fatty acids (%)	Traditional *Sızgıt*	Commercial *Sızgıt*
Lauric acid	3.28 [a]	2.94 [a]
Myristic acid	3.98 [a]	3.83 [a]
Palmitic acid	23.61 [b]	25.27 [a]
Palmitoleic acid	4.89 [a]	3.74 [b]
Stearic acid	21.90 [b]	25.76 [a]
Oleic acid	33.59 [a]	30.86 [b]
Linoleic acid	3.65 [a]	3.99 [a]
Linolenic acid	2.54 [a]	2.04 [a]
Arachidic acid	2.58 [a]	1.59 [a]
∑SFA	55.35 [b]	59.39 [a]
∑UFA	44.65 [a]	40.61 [b]
∑PUFA	6.19 [a]	6.03 [a]
SFA/UFA	1.24[b]	1.46[a]

a-b (→) Different letters within a row are significantly different (P<0.05).

Table 3. TBARS and color values of Sızgıt

TBARS values (µmol/kg *Sızgıt*)	Traditional *Sızgıt*	Commercial *Sızgıt*
$TBARS_{Average}$	7.17±0.84[b]	9.11±0.36[a]
$TBARS_{Min}$	5.02[b]	13.42[a]
$TBARS_{Max}$	9.51[a]	7.26[b]
Color Properties		
L*	61.23±1.23[a]	61.07±2.23[a]
a*	3.00±0.26[a]	3.99±2.27[a]
b*	8.37±0.87[a]	10.28±3.04[a]

a-b (→) Different letters within a row are significantly different (P<0.05).

There were no significant differences in color properties among all *Sızgıt* samples (Table 3). The differences in color properties of *Sızgıt* which can occur because of different formulation and thermal conditions during production could not be determined because of the completely non-homogenous appearance of *Sızgıt* samples.

Table 4. Microbial properties of Sızgıt

Microbial Count (log CFU/g *Sızgıt*)	Traditional *Sızgıt*	Commercial *Sızgıt*
Total aerobic mesophilic bacteria	$3.38x10^{6}$ [a]	$6.30x10^{6}$ [a]
Enterobacteria	$1.09x10^{2}$ [b]	$9.12x10^{3}$ [a]
Mold and yeast	$6.45x10^{4}$ [a]	$2.08x10^{3}$ [b]
Coagulase (+) *S. aureus*	N.D.	N.D.
Salmonella	N.D.	N.D.

a-b (→) Different letters within a row are significantly different (P<0.05).

The microbial counts of *Sızgıt* were presented in Table 4. The microbial counts of samples ranged from 5.18 to 6.94 log CFU/g for total aerobic mesophilic bacteria, from 0 to 3.69 log CFU/g for enterobacteria, from 2.67 to 4.95 log CFU/g for mold and yeast. Traditional samples had fewer enterobacteria count than commercial samples while the commercial samples had less mold and yeast count than traditional samples (P<0.05). On the other hand, *Salmonella* and *S. aureus* which are pathogenic bacteria were not determined in both types of *Sızgıt* samples. In the

Turkish food standards, kavurma that is similar meat product to *Sızgıt* and industrially produce should not contain *Salmonella*, *S. aureus* and *E. coli* microorganisms (TSE, 2012).

Conclusion

The results indicated that traditional and ethnic foods consumed frequently and abundantly by the local people may be a threat to public health. The public should be made aware of these threats and more conscious production and consumption of these products should be realized. As a result, measures should be taken in terms of food and public safety by preserving the traditional and ethnic structure of these products. Additionally, protective and promotional activities about food storage conditions in the underground warehouse should be done in the Cappadocia region.

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