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RESEARCH ARTICLE

Microbiological Quality of a Traditional Turkish Food Kokorec in Türkiye

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ABSTRACT

Kokorec, widely consumed in many regions of Türkiye, is popular traditional offal food. This study aimed to investigate the general microbiological quality of kokorec. A total number of 100 kokorec samples, 50 raw, and 50 cooked-spiced, were analyzed for the aerobic colony count (AAC), *Enterobacteriaceae*, enterococci, yeast, moulds, enterobacters, coliforms, *E. coli, Bacillus cereus*, Staphylococci and Micrococci. In the raw kokorec samples, it was determined that the mean level of AAC $1.8x10^7$ cfu/g, *Enterobacteriaceae* $7.9x10^4$ cfu/g, coliforms $1.4x10^5$ cfu/g, *E. coli* $4.4x10^4$ cfu/g, enterococci $1.0x10^5$ cfu/g, staphylococci and micrococci $1.5x10^5$ cfu/g, yeast $3.0x10^2$ cfu/g, mould $2.0x10^2$ cfu/g. *E. coli* were found positive in 18 (36%) out of 50 raw kokorec samples. However, *B. cereus* could not be isolated in any of the raw kokorec samples. On the other hand, in cooked-spiced kokorec samples, the average level of AAC was $3.2x10^5$ cfu/g, *Enterobacteriaceae* $7.1x10^4$ cfu/g, coliforms $2.4x10^4$ cfu/g, *E. coli* $1.1x10^3$ cfu/g, enterococci $2{,}4x10^6$ cfu/g, staphylococci and micrococci $1.1x10^3$ cfu/g, *B. cereus* $8.2x10^4$ cfu/g, yeast $5.9x10^2$ cfu/g, mould $2.1x10^1$ cfu/g. In cooked-spiced kokorec samples, *E. coli* was found at a rate of 4% and *B. cereus* was found at a rate of 20%. As a result of this research conducted on kokorec samples offered for consumption, it was determined that the microbiological quality was low because it could be contaminated with undesirable microorganisms at different levels during processing and consumption. Therefore, the consumption of kokorec, which is widely consumed in every region of Türkiye, carries a high risk potential for public health.

Keywords: Kokorec, Microbiological quality, Traditional offal food

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Türkiye'de Geleneksel Türk Yemeği Kokorecin Mikrobiyolojik Kalitesi

ÖZ

Türkiye'nin birçok bölgesinde yaygın olarak tüketilen kokoreç, popüler bir geleneksel sakatat yemeğidir. Bu çalışma kokorecin genel mikrobiyolojik kalitesini araştırmayı amaçlamıştır. 50'si çiğ, 50'si pişmiş-baharatlı olmak üzere toplam 100 kokoreç örneğinde aerobik koloni sayısı, *Enterobacteriaceae*, enterokok, maya, küf, enterobakter, koliform, *E. coli*, *Bacillus cereus*, stafilokok ve mikrokoklar yönünden analiz edildi. Çiğ kokoreç örneklerinde aerobik koloni sayısının ortalama $1{,}8x10^7$ kob/g, *Enterobacteriaceae*'nin $7{,}9x10^4$ kob/g, koliformların $1{,}4x10^5$ kob/g, *E. coli*'nin $4{,}4x10^4$ kob/g, enterokokların $1{,}0x10^5$ kob/g, stafilokoklar ve mikrokokların $1{,}5x10^5$ kob/g, maya sayısının $3{,}0x10^2$ kob/g, küf sayısının $2.0x10^2$ kob/g olduğu belirlendi. 50 çiğ kokoreç örneğinin 18'inde (%36) *E. coli* pozitif tespit edildi. Ancak çiğ kokoreç örneklerinin hiçbirinde *B. cereus* izole edilemedi. Öte yandan pişmiş-baharatlı kokoreç örneklerinde; aerobik koloni sayısının ortalama $3{,}2x10^5$ kob/g, *Enterobacteriaceae*'nin $7{,}1x10^4$ kob/g, koliformların $2{,}4x10^4$ kob/g, *E. coli*'nin $1{,}1x10^3$ kob/g, enterokokların $2{,}4x10^6$ kob/g, stafilokoklar ve mikrokokların $1{,}1x10^3$ kob/g, *B. cereus*'un $8.2x10^4$ kob/g, maya sayısının $5{,}9x10^2$ kob/g, küf sayısının $2{,}1x10^1$ kob/g olduğu tespit edildi. Pişmiş-baharatlı kokoreç örneklerinde *E. coli* %4, *B. cereus* %20 oranında bulunmuştur. Tüketime sunulan kokoreç örnekleri üzerinde yapılan bu araştırma sonucunda, işleme ve tüketim sırasında istenmeyen mikroorganizmalarla farklı düzeylerde bulaşabileceği için mikrobiyolojik kalitesinin düşük olduğu belirlendi. Bu nedenle Türkiye'nin her bölgesinde yaygın olarak tüketilen kokoreç tüketimi, halk sağlığı açısından bir risk potansiyeli taşımaktadır.

Anahtar kelimeler: Kokoreç, Mikrobiyolojik kalite, Geleneksel sakatat yemeği

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INTRODUCTION

Türkiye is a country located in the Anatolian peninsula in southwestern Asia and the Eastern Thrace regions of southeastern Europe. With this location, it serves as a cultural bridge between Asia and Europe. In addition, Türkiye has a wide variety of cultures that show the basic characteristics of Central Asian, Ottoman, Western and Islamic cultures and traditions. This cultural structure has enabled the creation of a rich content of Turkish cuisine, influenced by Turkish, Ottoman, Arabic, Greek and Persian cuisines. Also, Turkish cuisine has been influenced by those above cuisine and other neighbouring cuisines, as well as western European cuisines. Various local meat products such as döner kebab, roasted meat, sausage, pastrami, raw meatballs and kokorec are traditionally produced in Türkiye. (Anonymous 1, 2024; Kılıç, 2009).

In the production of many foods available in Türkiye, old practices and traditional methods have not been abandoned. Kokorec is one of these food items and offal dishes that have been produced and consumed in Türkiye for a long time. Kokorec is a traditional offal nourishment of the Balkans and Anatolia consisting mainly of cattle, lamb or goat intestines, often wrapping seasoned offal. The intestines of lambs of suckling age are used more. The small intestine is cleaned especially thoroughly and is filled with mesenteric fat. Small intestines prepared in this way are usually wrapped on a horizontal skewer and roasted on a charcoal, gas or electric grill. (Figure 1). Then, the chopped insides of the kokorec are mixed with chopped tomatoes and green peppers, and cooked in a large pan by adding hot red pepper and thyme. Using two spatulas, the cook constantly stirs and chops the mixture. When the preparation is finished, the food is kept warm on the grill until someone orders the service. Sometimes it is served in a piece of bread with adding some tomatoes or spices in it. It can also be served in half a loaf of bread or in a sandwich bread, plain or garnish, almost always with thyme and red pepper (Anonymous 2, 2024; Küçükkömürler and Koluman 2021). (Figure 2).

During the preparation of kokorec, intestinal microflora, inadequate cleaning, improper storage conditions, insufficient heat treatment, as well as long waiting times for consumption in the environment, may pose a microbiological risk to public health (Bilgin et al, 2008; Kara et al, 2013). Recently, concerns about food hygiene have increased consumers' awareness about food safety. Consumers' concerns about food safety and high demand for traditional food products are confronting. Although kokorec is popular traditional offal nourishment and widely consumed in all regions of Türkiye, only a few studies have been reported on the microbiological propertis of kokoreç recently. Therefore, the study aimed to determine the microbiological quality of kokoreç sold in different provinces of Türkiye.

Figure 1: The raw kokorec in Turkey

Figure 2: The cooked-spiced kokorec in Turkey

MATERIALS and METHODS

In this study, a total number of 100 kokorec samples, 50 raw and 50 cooked-spiced, were obtained from different provinces of Turkey. Samples were collected in sterile plastic bags and transported to the laboratory in a cold chain. Portions of kokorec (10 g) were transferred to a sterile stomacher bag with 90 mL of maximum recovery diluent (0.85% NaCl+0.1% peptone) (Merck 1.12535) and blended for 2 min in a stomacher (Masticator, IUL Instruments-Spain). Serial decimal dilutions were repeated using the same diluents up to 10^{-8}. Samples of 10^{-1} to 10^{-8} dilutions in 0.1 ml were then spread on the surface of agars.

Coventional microbiological methods and media were used to reveal total aerobic count, *Enterobacteriaceae*, coliforms, *E. coli*, enterococci, yeast, mold, *Micrococcus-Staphylococcus* and *B. cereus*. (Table 1).

The statistical analysis

Minitab-16 was used to calculate the mean, standard deviation, minimum value and maximum value of the data obtained.

RESULTS

In the present study, the presence of microorganisms isolated from raw and cooked-spiced kokorec samples are given in Table 2 and Table 3 respectively. In the raw kokorec samples, it was determined that the mean level of total aerobic count $1.8x10^7$ cfu/g, *Enterobacteriaceae* $7.9x10^4$ cfu/g, coliforms $1.4x10^5$ cfu/g, *E. coli* $4.4x10^4$ cfu/g, enterococci $1.0x10^5$ cfu/g, staphylococci and micrococci $1.5x10^5$ cfu/g, yeast $3.0x10^2$ cfu/g, moulds $2.0x10^2$ cfu/g. *E. coli* were found positive in 18 (36%) out of 50 raw kokoreç samples. Whereas, no *B. cereus* was isolated in all raw kokorec samples.

On the other hand, in cooked-spiced kokorec samples, it was noted that the mean level of total aerobic count $3.2x10^5$ cfu/g, *Enterobacteriaceae* $7.1x10^4$ cfu/g, coliforms $2.4x10^4$ cfu/g, *E. coli* $1.1x10^3$ cfu/g, enterococci $2.4x10^6$ cfu/g, *Micrococcus-Staphylococcus* $1.1x10^3$, *B. cereus* $8.2x10^4$, yeast $5.9x10^2$ cfu/g, moulds $2.1x10^1$ cfu/g. *E. coli* 4% were counted in the cooked-spiced kokorec samples. On the other hand, *B. cereus* was found 20% in the cooked-spiced kokorec samples. The results obtained from the research showed that the hygienic conditions of the the intestine and microbiological quality of the samples were low and never achieved. In this study, Although, *B. cereus* was not isolated in all raw kokorec samples, it was found 20% in the cooked-spiced kokorec samples

Table 1. Groups of Microorganisms and Analysis Methods

Microorganisms	Media	Incubation conditions	Metods
Total Aerobic Count	Plate Count Agar (Merck,1.05463.0500)	30°C 48-72 hour, Aerob	ISO 4833
Enterobacteriaceae	Violet Red Bile Dextrose Agar (Merck, 110275)	37°C 24-48 hour, Anaerob	ISO 7402
Coliform Bacteria	Violet Red Bile (Lactose) Agar (Oxoid, CM 0107)	37°C 24-48 hour, Aerob	ISO 4832
E. coli	Eosine Methylene Blue Agar (Merck, 1.01347.0500)	37°C 24-48 hour, Aerob	ISO 16649-1
Enterococci	Slanetz-Bartley Medium (Oxoid, CM 377)	37°C 18 hour, Aerob	Hartman et al. (1992)
Micrococcus-Staphylococcus	Baird-Parker Agar (Difco, 276840)	37°C 24-48 hour, Aerob	ISO 6888-1
Yeast	Yeast Extract Glucose Chloramphenicol Agar (Merck, 1.1600.0500)	25°C 4-5 days, Aerob	Pichhardt (1993)
Mould	Yeast Extract Glucose Chloramphenicol Agar (Merck, 1.1600.0500)	25°C 4-5 days, Aerob	Pichhardt (1993)
B.cereus	*Bacillus cereus* Selective Agar Base (Oxoid, CM 0617)	30°C 24 hour, Aerob	Lancette and Harmon, 1980

In present study, the mean value of TAMB was detected as $1.8x10^7$ cfu/g in the raw kokorec samples and $3,2x10^5$ in the cooked-spiced kokorec samples. The high count of TAMB found in kokorec samples might be attributed to the number of bacteria in raw kokorec materials, production conditions which were neither modern nor hygienic, unsuitable storage conditions, non-hygienic equipments, and contaminations induced by the environment and personnel. In present study, the mean numbers of yeasts and molds found in raw kokorec samples were $3.0x10^2$ and $2.0x10^2$ cfu/g, respectively.

Table 2. The results of microbiological analysis of raw kokorec samples (n: 50).

Microorganisms	Minimum (cfu/g)	Maximum (cfu/g)	Mean±SD (cfu/g)
Total Aerobic Count	$7.0x10^3$	$3.5x10^8$	$1.8x10^7±2.3x10^6$
Enterobacteriaceae	$<10^1$	$1.0x10^6$	$7.9x10^4±1.7x104$
Coliform Bacteria	$<10^1$	$2.3x10^6$	$1.4x10^5±2.4x10^4$
E. coli	$<10^1$	$3.5x10^6$	$4.4x10^4±5.2x10^4$
Enterococci	$<10^1$	$1.0x10^6$	$1.0x10^5±2.8x10^5$
Micrococcus-Staphylococcus	$<10^1$	$3.2x10^6$	$1.5x10^5±6.1x10^4$
Yeast	$<10^1$	$1.0x10^4$	$3.0x10^2±1.1x10^2$
Mould	$<10^1$	$2.4x10^3$	$2.0x10^2±3.6x10^5$

Table 3. The results of microbiological analysis of cooked-spiced kokorec samples (n: 50).

Microorganisms	Minimum (cfu/g)	Maximum (cfu/g)	Mean±SD (cfu/g)
Total Aerobic Count	$2.5x10^3$	$2.5x10^6$	$3.2x10^5±5.5x10^5$
Enterobacteriaceae	$<10^1$	$1.6x10^6$	$7.1x10^4±3.2x10^5$
Coliform Bacteria	$<10^1$	$6.0x10^5$	$2.4x10^4±1.2x10^5$
E. coli	$<10^1$	$1.0x10^4$	$1.1x10^3±2x10^3$
Enterococci	$<10^1$	$3.0x10^7$	$2.4x10^6±8.2x10^6$
Micrococcus-Staphylococcus	$<10^1$	$1.0x10^4$	$1.1x10^3±2.5x10^3$
B. cereus	$<10^1$	$8.0x10^5$	$8.2x10^4±1.7x10^5$
Yeast	$<10^1$	$7.0x10^3$	$5,9x10^2±1.6x10^3$
Mould	$<10^1$	$2.0x10^2$	$2.1x10^1±4.1x10^1$

On the other way, The mean numbers of yeasts and molds found in cooked-spiced kokorec samples were $5.9x10^2$ and $2.1x10^1$ cfu/g, respectively. According to these results, it is strongly suggested that the need to improve hygienic conditions, and storage conditions in the manufacturing of this product are necessery. It is also recommended that consumers should eat these products well-cooked.

We detected that the mean of *Enterobacteriaceae*, coliform, and *E. coli* counts were found as $7.9x10^4$, $1.4x10^5$, and $4.4x10^4$ cfu/g in raw kokorec samples; and as $7.1x10^4$, $2.4x10^4$ and $1.1x10^3$ in cooked-spiced kokorec samples, respectively. The presence of *E. coli*, which is closely related to fecal contamination and the presence of enteric pathogens, was observed in 18 out of 50 samples (36%) in raw kokoreç samples. However, *E. coli* were counted 4% in the cooked-spiced kokorec samples. The presence of Enterobacteriaceae bacteria, coliforms and *E. coli* in the samples suggests unhygienic practices during the preparation of kokorec. As a result, kokoreç produced at home or commercially may cause food infections and intoxications. Therefore, these results reveal the need to implement regulatory measures such as good manufacturing practices at all stages of the production chain (preparation of raw intestines, cooking, serving) to ensure the microbiological safety of kokoreç sold openly.

Enterococcus sp. bacteria of this genus are thought to be important as indicators of potential pathogenic microorganisms as they cause spoilage in foods. In the present study, the mean enterococci count was $1.0x10^5$ cfu/g in raw kokorec samples and $2.4x10^6$ cfu/g in cooked-spiced kokorec samples.

In this study mean *Staphylococcus-Micrococcus* count was $1.5x10^5$ cfu/g in raw kokorec samples while mean *Staphylococcus-Micrococcus* count was $1.1x10^3$ cfu/g in cooked-spiced kokorec samples. The main reservoir of *Staphylococcus-Micrococcus* is skin, nasal cavity, and throat in human and animal. The presence of *Staphylococcus-Micrococcus* might be resulted from either insufficient heat treated kokorec, or transmitted from human and animal. As a consequence food products may be orginally become contaminated during or after processing.

DISCUSSION

In these various studies conducted in Turkey, many microorganisms, including spore-forming bacteria, have been identified in spices (Tekinşen and Sarıgöl, 1982; Yıldırım et al., 1997; Aksu et al., 1997; Filiz, 2000; Üner et al., 2000; Çoşkun, 2010). In our study, we found that the presence of B. cereus and other microorganisms increased after the addition of spices to kokoreç samples. Spices used as flavor enhancers in meat products can be contaminated with bacteria, mold and yeast. Processing methods, moisture content and grain size affect the microbial load and diversity of spices (Akgül, 1993).

Yentür et al. (1989) stated that total aerobic count, coliform, *Escherichia coli*, *Staphylococcus*, and yeast-mould counts in cooking kokorec samples as 10^4-10^7; $4.0x10^4$; $7.8x10^2$; $1.0x10^3$ and $1.8x10^6$ cfu/g, respectively in Ankara. Temelli et al. (2002) examined the microbiological quality of a total of 30 kokoreç samples, 10 each raw, cooked and cooked-spiced, from different regions of Bursa. TAMB was 10^5-10^7 cfu/g,

10^4-10^5 cfu/g and 10^5-10^6 cfu/g in raw, cooked and spice-added kokoreç, respectively; coliform bacteria counts were 10^4-10^7 cfu/g, <1.0 x 10^1-10^4 cfu/g and 10^4-10^5 cfu/g in raw, cooked and spiced kokorecs, respectively; *E. coli* counts were 10^1-10^6 cfu/g, <1.0x10^1 cfu/g and <1.0x10^1 cfu/g in raw, cooked and post-cooked kokorecs with spices added, respectively; *Enterobacteriaceae* numbers were 10^4-10^6 cfu/g, 10^2-10^4 cfu/g and 10^3-10^5 cfu/g in raw, cooked and post-cooked kokorecs with spices added, respectively; Enterococcus numbers were 10^3-10^5 cfu/g, 10^2-10^4 cfu/g and 10^2-10^4 cfu/g in raw, cooked and spiced kokorecs after cooking, respectively; *Staphylococcu*s and micrococci counts were 10^3-10^6 cfu/g, 10^2-10^4 cfu/g and 10^3-10^5 cfu/g in raw, cooked and post-cooked kokorecs with spices added, respectively; yeast and mold counts were found to be 10^3-10^6 cfu/g, <1.0x10^2-10^4 cfu/g and 10^2-10^4 cfu/g in raw, cooked and post-cooked kokorecs with spices added, respectively.

Hampikyan et al (2008) reported that total aerobic count, coliform, *E. coli*, *S. aureus* counts in 15 kokorec samples as 5.3x10^3- 7.0 x10^5, <1.0x10^1- 2.1x10^4, <1.0x10^1-6.6 x10^2, <1.0x10^2- 4.8x10^3, respectively in Istanbul. (Kara et al. 2013) determined that TAMB, *Enterobacteriaceae*, coliform, *Escherichia coli*, *Enterococcus* spp., *Micrococcus-Staphylococcus*, yeast-mould counts in 50 kokorec samples as 6.29, 4.35, 2.43, 2.10, 4.17, 2.85, 5.89 log kob/g, respectively in Afyon. Kılıç (2016) found that TAMB, total coliform bacteria and yeast-mold numbers in raw kokoreç collected from 10 different restaurants in Isparta were 2.5 x10^7, 1.3x10^5, 1.5x10^5 cfu/g, respectively; TAMP, total coliform bacteria and yeast-mold numbers in cooked kokorec were 5.3x10^3, 1.0x10^1, 1.0x10^1 cfu/g, respectively; TAMP, total coliform bacteria and yeast-mold numbers in spicy-cooked kokorec were found to be 1.1x10^6, 5.7x10^5, 5.5x10^3 cfu/g, respectively.

Bilgin et al. (2016) investigated the microbiological qualities of raw, grilled and tandoor-cooked kokoreç. Accordingly, total aerobic count coliform bacteria and *S. aureus* in raw kokoreç were 3.8x10^7, 2.2x10^4, 3.2x10^3 cfu/g, respectively; total aerobic count, coliform bacteria, *S. aureus* in grilled kokoreç were 1.2x10^3, 5.7x10^1, 1.2x10^2 cfu/g, respectively; In tandoor-cooked kokoreç, total aerobic count, coliform bacteria and *S. aureus* were detected as 2.3x104, 8.6x101, 3.1x102 cfu/g, respectively. Akgöl et al. (2023) examined the microbiological quality of cooked plain and cooked spicy kokoreç samples taken from 3 different restaurants in Elâzığ. They found, on average, TAMB 3.92, 4.03, coliforms 2.04, 2.49, *Staphylococcus-Micrococcus* 1.65, 2.04, yeast-mold 1.16, 2.10 and $\log_{10}$ cfu/g in cooked plain and cooked spicy kokorec, respectively. These different results in the studies may be due to the difference in the microbial load of the spices used, personnel hygiene and storage conditions. Although there are many studies carried out regarding the microbiology of kokorec, in Türkiye, there has been still no national standart established for kokorec in Turkish Food Standarts. Because of the manufacturing technique and the hygienic concerns on raw material, it has been believed that kokorec is not suitable food in terms of safety and consumer health. Therefore, it is recommended to keep kokorec at temperatures between 60°C and 74°C before serving. In addition, time-temperature integrators are increasingly used in the packaging of long-term chilled foods to inform consumers about the cooling conditions to which foods are exposed throughout the distribution chain and to help them make food safety decisions. (Tache and Carpentier, 2014).

CONCLUSION

As a result of this research conducted on kokorec samples, which are very popular among street delicacies in Türkiye, it was determined that they could be contaminated with pathogenic and spoilage microorganisms at different levels during processing and consumption and that their microbiological quality was low. Hence, the consumption of the kokorec carries a high potential risk for the public health. For this reason, compliance with hygienic rules during the preparation and presentation of kokorec for consumption is very important in terms of food safety and public health. In order to produce uninterruptedly safe products "from farm to table", HACCP and GMP rules must be followed in all chains from production to consumption. In addition, traditional kokorec production methods need to be transformed into methods using modern technologies while preserving the familiar taste. At the end, EU prohibeted the consuption of kokoreç prepared unhygiene condition, So, On the way of join to the EU for Türkiye, it is higly important to put some legal standars for kokoreç.

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Authors' Contributions: SÖ and FT contributed to the project idea, design and execution of the study. SÖ, MM and FT contributed to the acquisition of data. SÖ and MM analysed the data. SÖ and MM drafted and wrote the manuscript. SÖ, MM and FT reviewed the manuscript critically. All authors have read and approved the finalized manuscript.

Ethical approval: "This study is not subject to the permission of HADYEK in accordance with the "Regulation on Working Procedures and Principles of Animal Experiments Ethics Committees" 8 (k). The data, information and documents presented in this article were obtained within the framework of academic and ethical rules."

REFERENCES

Akgül, A. (1993). Baharat bilimi ve teknolojisi. Gıda Teknolojisi Derneği Yayınları.

Akgöl M., Alan S. and Öksüztepe G. (2023). Elazığ'da tüketime sunulan kokoreçlerin mikrobiyolojik kalitesi. F.Ü. Sağ. Bil. Vet. Derg., 37(2), 114-121.

Aksu H., Bostan K. and Ergün Ö. (1997, August). Incidence of *Bacillus cereus* in processed spices and herbs sold in Turkey [Bildiri sunumu]. World Congress On Food Hygiene. Hague.

Anonymous 1. Turkish cuisine (2024, 15 Ağustos). In wikipedia. https://en.wikipedia.org/wiki/Turkish_cuisine .

Anonymous 2. Kokoreç (2024, 15 Ağustos). In wikipedia. https://tr.wikipedia.org/wiki/Kokore%C3%A7

Bilgin B., Makarnacı N. and Palabıyık İ. (2016). The effect of different cooking process on microbiological quality of kokorec. International Journal of Research in Engineering and Technology, 05(05), 6-8.

Coşkun F. (2010). Tekirdağ piyasasında satılan bazı baharatların mikrobiyolojik özellikleri. Journal of Tekirdag Agricultural Faculty, 7(1), 85-93.

Deak T. (2007) Yeast in specific types of food. Dead, T. (Ed) In: Handbook of food spoilage yeast, 2 nd Edition (p. 117-203). Routledge, Taylor and Francis Group.

Filiz N. (2000). Bursa'da tüketime sunulan bazı baharatların mikrobiyal florası. Uludağ Üniversitesi Veteriner Fakültsi Dergisi, 20(1-2), 103-107.

Hampikyan H., Ulusoy B., Bingöl E.B., Çolak H. and Akhan M. (2008). İstanbul'da tüketime sunulan bazı izgara tipi gıdalar ile salata ve mezelerin mikrobiyolojik kalitelerinin belirlenmesi. Türk Mikrobiyoloji Cemiyeti Dergisi, *38*(2), 87-94.

Hartman P.A., Deibel R.H. and Sieverding L.M. (1992). Enterococci. C. Vanderzant, D.F. Splittstoesser (Eds.), Compendium of methods for the microbiological examination of foods, (pp. 523-531). American Public Health Association.

James, J.M. (2000). Modern food microbiology. 6th Edition. Aspen Publishers Inc.

Kara R., Aslan S., Yaman H. and Akkaya L. (2013). Afyonkarahisar'da tüketime sunulan kokoreçlerin mikrobiyolojik kalitesinin belirlenmesi. Kocatepe Vet. J., 2013, 6 (1), 7-10. https://doi.org/10.5578/kvj.5340 .

Kılıç B. (2009). Current trends in traditional Turkish meat products and cuisine. LWT - Food Science and Technology, 42(10), 1581–1589. https://doi.org/10.1016/j.lwt.2009.05.016 .

Kılıç B. (2016). Determination of microbiological quality of kokoreç sold in Isparta. Scientific Papers. Series D. Animal Science, *LIX*, 296-298.

Küçükkömürler S. and Koluman A. (2021). Tüketicilerin sakatat tüketimi ve tercihi. Journal of Recreation and Tourism Research, 8(1), 120-143.

Lancette G.A. and Harmon, S.M. (1980). Enumeration and confirmation of *Bacillus cereus* in foods: Collaborative study. Journal of the Association of Official Analytical Chemists, 63(3), 581–586. https://doi.org/10.1093/jaoac/63.3.581 .

Pichhardt K. (1993). Lebensmittelmikrobiologie. Springer-Verlag.

Tache J. and Carpentıer B. (2014). Hygiene in the home kitchen: Changes in behaviour and impact of key microbiological hazard control measures. Food Control, 35(1), 392-400. https://doi.org/10.1016/j.foodcont.2013.07.026 .

Tekinşen O.C. and Sarıgöl C. (1982). Elâzığ yöresinde tüketime sunulan baharatın mikrobiyal florası. Fırat Unv. Vet. Fak. Derg, 1(2), 151-162.

Temelli S., Saltan Evrensel S., Anar S. and Tayar M. (2002). Bursa'da tüketilen kokoreçlerin mikrobiyolojik kalitesinin belirlenmesi. İstanbul Üniversitesi Veteriner Fakültesi Dergisi, 28(2) 467–73.

Üner Y., Çetin Ö. and Ergun Ö. (2000). Baharatta görülen mikrobiyolojik kontaminasyonlar. *İstanbul Üniversitesi Veteriner Fakültesi Dergisi, 26*(1), 27-34.

Yentür G., Abbasoğlu U. and Bayhan A. (1989) Research on the microbiological qualities of kokoreçs consumed in Ankara. Gazi Ünversitesi Eczacılık Fakültesi Dergisi, 6(2), 12-15.

Yıldırım T., Tanrıseven A. and Özkaya Ş. (1997). Bursa ve Sakarya kırmızıbiberlerinde aflatoksin çalışması. Gıda Teknolojisi, 2(6), 60-64.