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**CHEMICAL AND FATTY ACID CHANGES WHICH OCCUR IN TRADITIONAL  
SURROUNDING SUDJUK BEFORE AND AFTER THERMAL PROCESSING**

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**S U M M A R Y**

The chemical and fatty acid changes that occur in the traditional Prizren sujuk are presented in the article.

Prizren sujuk belongs to the group of semi-roasted sausages that are produced exclusively from beef. The technological process begins with mincing the meat in a wolf machine. The minced meat is transferred to a mixer where salt and spices are added. After achieving the appropriate homogenization of the minced meat with the salt and spices, the filling is transferred to the filler. Sausages are stuffed in thin beef intestines.

Immediately after filling the intestines, the chemical and fatty acid composition of freshly produced sausages - sudjuk was tested. The ph value of the charge immediately after the charge is 6.10. The water content of fresh sausages is 53.30%, proteins 15.32%, fats 22.50%, 2.77% salt and 1.66% sugars. The content of saturated fatty acids immediately after filling is 11.12%.

After heat treatment, the chemical composition changes, that is, the water content decreases and amounts to 42.97%, the other components are increased and thus the protein content is 21.05%, fats 30.50%, salt 3.33%, and sugars 2.36%. After heat treatment, the content of saturated fatty acids increases and amounts to 14.95%.

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**Key words:** sausages - sujuk, chemical composition, fatty acids,

## INTRODUCTION

Recently, man has increasingly oriented himself towards the production of healthy and quality food, i.e. the production of food products that contain all the necessary nutrients in quantities and proportions that are easily digestible and usable by the human body and are produced from healthy raw materials and in healthy natural conditions.

The nutritional quality of quality food can only be achieved if fresh and quality raw materials are used and if appropriate technological procedures are used during the technological production process that will ensure that the nutritional quality is preserved and improved and the desired sustainability and sensory characteristics are achieved that will make them sought after and appreciated by consumers.

In the group of traditional meat products produced in Prizren and the surrounding area, the Prizren sudžuk ranks first.

Sudžuk as a type of sausage is produced in several varieties and this depends on the demands and habits of consumers. In Kosovo, i.e. in the area of Prizren, sausages of the type sudžuk are produced where onion is used as a spice, while garlic is used for the production of the famous Bosnian sudžuk.

Traditional Prizren sausage is a sausage product that is mostly produced and consumed in Prizren and its surroundings. This type of sausage is characterized by medium quality and excellent sensory characteristics, and confirmation of this is that they have a high demand. The quality of the sausages is seen through the raw material used (fresh meat) which is obtained by slaughtering quality fattening breeds of cattle - heifers in our own slaughterhouse. In the production of traditional Prizren sudžuk, dry heat treatment is applied (smoking and roasting in chambers with an open firebox) using naturally dry beech wood.

The goals of this research are aimed at examining the changes that occur in the chemical and fatty acid composition of Prizren sudžuk before and after heat treatment.

## MATERIAL AND METHOD

The examination of the chemical and fatty acid changes that occur in the traditional Prizren sudžuk before and after thermal processing was carried out in a small but modern meat industry in Prizren.

As a material for the production of the Prizren sudžuk, beef produced in its own slaughterhouse was used. The meat used for the production of the traditional Prizren sudžuk comes from the neck, chest, ribs and head. The recipe for the production of the traditional Prizren sudžuk is as

follows: neck meat 11.7%, chest meat 30.9%, rib meat 23.25%, head meat 6.0%, beef tallow 6.2%, salt 2.4%, freshly ground onion 11.3%, black pepper 0.1% and red pepper 1.5%.

The technological process for the production of traditional Prizren sudzhuk begins with the separation of meat from the neck, chest, ribs and heads. Immediately after the separation of the meat and beef fat, it is minced in a meat grinder. After the meat is minced, salt, onion, black and red pepper are added and mixed in a blender. After achieving the necessary uniformity of the meat and additives, it is stuffed into fresh thin beef casings. The casings are filled with a vacuum filler. After filling the casings, i.e. the now formed sausages are arranged on a frame cart for thermal processing.

After filling the frame cart, the sausages are left to dry for 24 hours and then thermal processing is performed. Thermal processing is performed in a primitively built chamber with an open firebox.

The tests of the chemical and fatty acid composition of traditional Prizren sudzhuk were carried out immediately after filling the casings and after thermal processing.

## RESULTS AND DISCUSSION

The results obtained from the conducted tests on the chemical composition of the traditional Prizren sudžuk before and after thermal processing are given in Table 1.

Table 1. Chemical composition of the traditional Prizren sudžuk before and after thermal processing

Indicator	Before heat treatment	After heat treatment
Water	56,70±2,97	41,47±3,01
Dry matter	43,30±2,53	58,53±2,71
Proteins	15,32 ± 0,84	21,05±1,15
Feat	22,50 ± 0,36	30,50 ±0,47
Saturated fatty acids	11,12 ± 0,33	14,95±0,45
Sugar	1,66	2,36
Mineral substances	3,82 ± 0,11	4.62±0,13
Salt	2,77 ± 0,10	3,3301±0,13
Energy value kJ/100 g	1.236	1.721

As can be seen from the data presented in Table 1 on the chemical composition of traditional Prizren sudzhuk immediately after production, the water content is on average 56.7%,

and after heat treatment it is 41.47%. The protein content in traditional Prizren sudzhuk immediately after filling the casings is 15.32%, and after heat treatment 21.05%. The content of saturated fats before heat treatment is 22.50, and after heat treatment their content is increased and is 30.50%: The content of saturated fatty acids in traditional Prizren sudzhuk before heat treatment is 11.12%, and after heat treatment 14.95%. The total content of mineral substances before heat treatment is 3.82% and the salt content is 2.77%. After heat treatment, the total content of mineral substances is 4.62% and the salt content is 3.33%.

The energy value of fresh traditional Prizren sudzhuk is 1,236 kJ/100 g, and after heat treatment it is 1,721 kJ/100 g.

The results obtained from our tests compared with the results obtained by other researchers are identical. Thus, according to the tests of Elmazi K. 2023, for the chemical composition of tea sausages during fermentation, the amount of water decreases from 56.93% to 36.36%, the protein content increases from 16.90% to 23.72%, the fat content from 21.50% to 36.55%, the total mineral substances increase from 3.65% to 4.80% and the cooking salt from 2.05% to 4.57%.

Similar results for the change in the chemical composition of fermented sausages were found by Saičić Snezana et al. (2010) where the water content is from 27.58% to 28.16%, the protein content is from 22.58% to 24.14%, the fat content is from 34.36% to 43.81% and the salt content is 4.09% to 4.2%.

According to numerous studies, the changes that occur in the chemical composition before and after heat treatment are greatly influenced by the type and physical composition of the filling in the production of sausages, as well as the degree of roasting and the roasting time.

The fatty acid composition of traditional Prizren sudžuk before and after heat treatment is given in Table 2.

Table 2. Fatty acid composition of traditional Prizren sudžuk before and after heat treatment

Ord. No.		Fatty acid content
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	Fatty acid	before heat treatment	after heat treatment
1	C10:0	0,0793	0,0776
2	C12:0	0,1216	0,1187
3	C14:0	3,2937	3,3195
4	C14:1	0,8993	0,9271
5	C15:0	0,4229	0,4304
6	C15:1	0,1363	0,1417
7	C16:0	23,6160	24,0039
8	C16:1	3,0103	3,1073
9	C17:0	1,3513	1,3568
10	C17:1	0,4993	0,5014
11	C18:0	20,3507	21,6029
12	C18:1n9t	4,5276	4,4937
13	C18:1n9c	37,3274	35,7127
14	C18:1n6t	0,2375	1,2009
15	C18:2n6c	4,1464	3,5502
16	C18:2n6c	1,3123	3,9830
17	C18:3n6	0,0854	0,0895
18	C20:1	0,1528	0,1514
19	C18:3n3	0,7400	0,7439
20	C22:1n9	-	-
<b>Saturated fatty acids- SFA</b>		<b>49,1687</b>	<b>50,8435</b>
<b>Monounsaturated fatty acids -MUFA</b>		<b>41,0672</b>	<b>39,5832</b>
<b>Polyunsaturated fatty acids-PUFA</b>		<b>4,9777</b>	<b>4,8222</b>
<b>Trans fatty acids -transFA</b>		<b>4,7864</b>	<b>4,7511</b>

As can be seen from the data presented in Table 2, the total content of saturated fatty acids - SFA in traditional Prizren sudzhuk before heat treatment is 49.1687% and after heat treatment 50.8435%. In the total content of saturated fatty acids - SFA, the most abundant is the fatty acid C16:0, which in fresh sudzhuk is 23.6160%, and after heat treatment 24.0039%. The

second most abundant is the fatty acid C18:0 with 20.3507% before heat treatment, and after heat treatment the content is 21.6029%. The remaining saturated fatty acids (C10:0, C12:0, C14:0, C15:0 and C17:0) are present in much smaller quantities.

The content of Monounsaturated fatty acids –MUFA in traditional Prizren sudzhuk before heat treatment is 41.0672%, and after heat treatment they are 39.5832%. In the total content of Monounsaturated fatty acids – MUFA, the most abundant fatty acid is C18:1n9c, which in fresh traditional Prizren sudzhuk is 37.3274%, and after heat treatment 35.7127%. The remaining Monounsaturated fatty acids – MUFA are present in smaller quantities,

The content of Polyunsaturated fatty acids-PUFA in traditional Prizren sudzhuk before heat treatment is 4.9777%, and after heat treatment they are 4.8222%.

The content of Trans fatty acids – transFA in traditional Prizren sudžuk before heat treatment is 4.7864 %, and after heat treatment 4.7511 %.

The changes that occur in the fatty acid composition of traditional Prizren sudžuk before and after heat treatment are the result of the influence of temperature during heat treatment, which causes denaturation, oxidation and polymerization of fatty acids and as a result, changes occur.

According to numerous studies, it has been found that beef contains a higher amount of saturated fatty acids – SFA compared to pork. Thus, according to the studies of Bartoň L., et al. 2010, the content of saturated fatty acids (SFA) is from 48.82 % to 50.22 %. The content of monounsaturated fatty acids (MUFA) is from 38.90 % to 40.39 %.

The fatty acid composition of meat in different species of animals and different age categories varies within significantly large limits. Studies conducted by a number of researchers (Sami A.S., et al. 2004, Kazala E.C., et al.2006, Bureš D.,et al. 2006, Plasentier ,E., et al. 2009, Petrović N., et al. 2010, Bartoň L., et al. 2010, Štorković I. et al. 2013) have concluded that variations in the fatty acid composition of fat in the same species of animals vary, and this is the result of the influence of genetic and progenetic factors. Which factors have what influence is very difficult to define, because all these factors act in combination with each other.

For the production of quality cured meat products, it is recommended that animals be slaughtered in late autumn or early winter, because such adipose tissue has a compact type and a higher proportion of saturated fatty acids that are less susceptible to oxidation and have greater sustainability.

## CONCLUSION

Based on the conducted tests of the changes that occur in the chemical and fatty acid composition of traditional Prizren sudžuk, the following conclusions can be made:

- Traditional Prizren sudžuk is a sausage product that is produced in Prizren and its surroundings in a traditional way;

- The water content in traditional Prizren sudžuk before thermal processing is 56.7%, and after thermal processing it is 41.47%;

- The protein content in traditional Prizren sudžuk before thermal processing is 15.32%, and after thermal processing is 21.05%;

- The total fat content before thermal processing is 22.50, and after thermal processing is 30.50%;

- The content of saturated fatty acids in traditional Prizren sudžuk before heat treatment is 11.12%, and after heat treatment 14.95%;

- The content of mineral substances before heat treatment is 3.82% and after heat treatment 4.62%;

- The content of salt before heat treatment is 2.77%, and after heat treatment 3.33%.

- The energy value of traditional Prizren sudžuk before heat treatment is 1,236 kJ/100 g, and after heat treatment 1,721 kJ/100 g.

- The content of Monounsaturated fatty acids –MUFA in traditional Prizren sudžuk before heat treatment is 41.0672%, and after heat treatment 39.5832%;

- The content of Polyunsaturated fatty acids-PUFA in traditional Prizren sudzhuk before heat treatment is 4.9777 %, and after heat treatment 4.8222 %.

- The content of Trans fatty acids – transFA in traditional Prizren sudzhuk before heat treatment is 4.7864 %, and after heat treatment 4.7511 %.

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