

SENSORY EVALUATION AND QUALITY OF TRADITIONAL SMOKED MEAT PRODUCTS FROM SERBIA AND MONTENEGRO – SIGNIFICANCE FOR CONSUMERS

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Review paper

Abstract: This paper reviews researches published in recent years (2005-2015) concerning sensory properties and quality of smoked meat and meat products from Serbia and Montenegro. The newest results are presented as well. These researches are results of long and a successful collaboration between Federal Centre for Meat Research, Kulmbach, Germany (now Max Rubner-Institute) and Institute of Meat Hygiene and Technology, Belgrade, Serbia. Sensory evaluation of the products was done according to the DLG-5-point-testing-scheme by experts in Kulmbach as well as participating in the official international DLG quality tests in Germany. Traditional smoked meat products from Serbia and Montenegro showed satisfactory sensory evaluations. 57% of the analysed samples (smoked beef, pork and sheep ham and poultry salami, n=155) were evaluated with DLG award in Gold, 31% in Silver, while 12% of smoked ham were evaluated in DLG award in Bronze. At consumers' point of view, traditional smoked meat and meat products from Serbia and Montenegro, would be enrichment for the (West) European market. High salt content and too strong smoke of the meat products are the main deficiencies.

Key words: sensory evaluation, traditional, smoked meat products, consumer

Introduction

Meat and meat products are important sources of proteins, trace elements and vitamins and its consumption has been important in human species evolution, especially the brain and intellectual development (*Pereira and Vicente, 2013*). For consumers, sensory properties of meat and meat products are very important (*Font-*

I-Furnols and Guerrero, 2014). With the purchase of food German consumers look for security and orient themselves to quality awards. The average consumption of meat products in Germany in 2013 were shown in Figure 1 (*DFV, www.fleischerhandwerk.de, 2015*). According to one industrial slaughterhouses in Serbia (*Glamočlija et al., 2015*), Serbian sausage was the most represented sausage (33.05%), followed by cooked (24.23%) and homemade sausage (17.12%). The most represented smoked products was dry bones (33.22), followed by dry meat (28.25%) and bacon (24.52%). Consequently, the percentage of production of the product is proportional to their consumption by Serbian population.

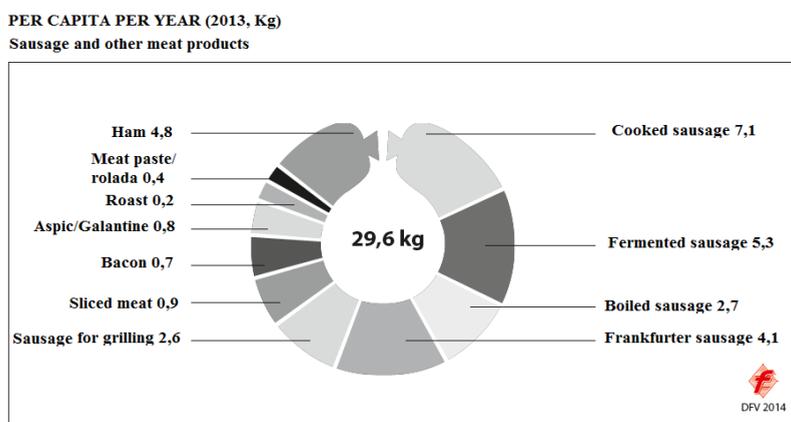


Figure 1. The average consumption of sausage and other meat products in Germany in 2013

This paper reviews researches published in recent years (2005-2015) and shows the newest results, concerning sensory properties and quality of smoked meat products from Serbia and Montenegro. These researches are results of long and a successful collaboration between Federal Centre for Meat Research, Kulmbach, Germany (now Max Rubner-Institute) and Institute of Meat Hygiene and Technology, Belgrade, Serbia. Additionally, the aim of this study was to determine whether the traditionally smoked meat products from Serbia and Montenegro satisfy the German quality criteria, and accordingly, whether such products could be exported to the German market.

Physico-chemical properties of smoked meat

Quality of traditional smoked meat products were tested by performing different physico-chemical parameters (pH-value; a_w -value; peroxide value; acid value; content of water, protein, fat, ash, sodium chloride, nitrite, nitrate), (*Troeger et al., 2009*). Fatty acids composition and content of polycyclic aromatic hydrocarbons of some smoked meat products from Serbia (Zlatiborac, Mackat) were performed by applying GC/ECD and HRGC/MS/MS, respectively (*Djinovic,*

2008). Physico-chemical properties of different smoked meat and smoked meat products from Serbia (Zlatibor) were analysed in few common studies (Troeger *et al.*, 2009; DjinoVIC, 2008). Table 1 shows properties of beef ham. The pH values were in the standard range for this type of product. The a_w values were between 0.886 and 0.933 and they provide product safety e.g. prevent growth pathogenic bacteria (Leistner *et al.*, 1981). The salt content of ham valued between 3 and 6.1%. According to the literature data the average salt content for these products is 4.5% (Vukovic, 2012). Contents of nitrate (495 and 680 mg/kg) in 2 samples were higher than MDK value (250 mg/kg), while the nitrite content was in the standard range. Mean content of benzo(a)pyrene (1.7 µg/kg) was below MDK value (2 µg/kg).

Table 1. Physical properties, curing salt and Benzo(a)pyrene content of raw cured beef (beef ham, n=17) (Troeger *et al.*, 2009)

Statistical parameters*	pH-value	a_w -value	NaCl [%]	Nitrite [mg/kg]	Nitrate [mg/kg]	Benzo[a]pyrene [µg/kg]
Mean	5.54	0.903	4.9	13	227.5	1.7
SD*	0.17	0.021	1.13	10.8	234.9	0.16
Min	5.38	0.886	3	1	37	1.5
max	5.77	0.933	6.1	33	680	1.8

*Statistical parameters expressed as standard deviation (SD), mean, maximum (max) and minimum (min) value.

According to DjinoVIC (2008) the protein content of beef ham was between 28.9% and 38.1%, while the fat content was between 7.2% and 10.1%. The results for raw hams from Montenegro (Njegusi, Montenegro) showed that NaCl content was between 7.87% and 9.05% while this content in fermented sausage was lower (from 3.52% to 5.75%), (Troeger *et al.*, 2006). The content of nitrate in some smoked samples from Montenegro was higher than MDK value and was between 153.9 mg/kg and 562.8 mg/kg. This can be explained by the high nitrate content (2723 ppm) in used sea salt. The other physical and chemical parameters were in the standard range (Troeger *et al.*, 2006).

Sensory evaluation

German Agricultural Society (DLG) that promotes product quality of foods, every year in Germany, organizes the DLG Quality Tests. The “DLG Award Winner” label is only issued to food that have been found worthy of it in sensory testing and that satisfy the DLG’s stringent quality criteria. Sensory evaluation of the products from Serbia and Montenegro was done according to the DLG-5-point-testing-scheme (DIN ISO/IEC 17065, 2013; DIN ISO/IEC 17024, 2012). DLG Award could be achieved as: DLG award in Gold (excellent, quality figures 5), DLG award in Silver (very good, quality figures 4.6-4.99), DLG award in Bronze (good, quality figures 4.1-4.59) and without DLG award (quality figures <4.00), (DLG Certification Unit, 2014).

The products delivered from Serbia (n=146) and Montenegro (n=9) (smoked beef, pork, sheep products, and poultry salami) have reached above-average DLG evaluations (in gold 57 % , silver 31 % and bronze 12 %), (Figure 2.). The sensory evaluations revealed deviations of the fat taste in some products, which were correlated with a higher level of polyunsaturated fatty acids. That probably indicates on unsuitable raw material. On the other hand, sensory evaluation of hams from Čajetina, named “Dalmatinski prsut”, resulted in high resp. highest ratings (Troeger *et al.*, 2007). The main deficiencies of sensory properties for row cured meat referred to the external appearance i.e. external preparation (poorly dressed-remarks samples, 9-10%), consistency (too soft samples, 7-8%), odor and taste (salty samples, 14-15%), (Stiebing *et al.*, 2014). Type of smoking can cause the mentioned deficiencies of smoked meat products.

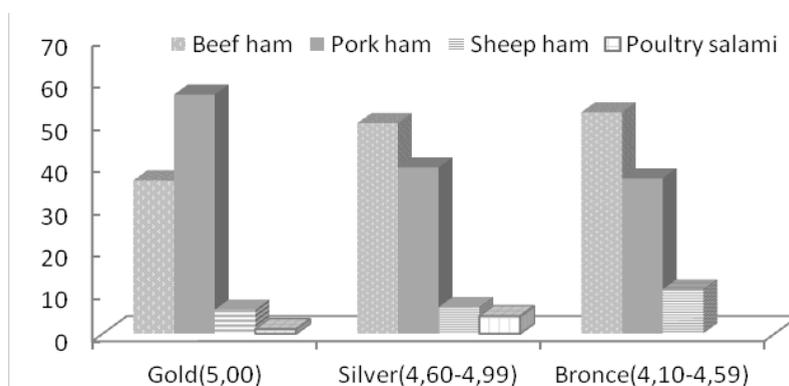


Figure 2. Sensory evaluation of smoked ham occurrence [%] of quality numbers

The newest results with Serbian consumers, concerning sensory properties of different traditional products was carried out during 81st International Agricultural Fair in Novi Sad, Serbia (Table 2).

Table 2. Results of consumers' sensory evaluation of salami, sausage and chicken salami during International Agricultural Fair in Novi Sad, Serbia, 2014 (n=85, rating in %)

#	Taste % (n)			Salt content % (n)			Smoke (n)		
	I*	II*	III*	I	II	III	I	II	III
3	55.3 ^{A,B} (47)**	63.5 ^{A,B} (54)	69.4 ^{A,B} (59)	83.5 ^{A,B} (71)	84.7 ^{A,B} (72)	88.2 ^{A,B} (75)	76.5 ^{A,B} (65)	82.4 ^{A,B} (70)	74.1 ^{A,B} (63)
2	31.8 ^{A,C} (27)	31.7 ^{A,C} (27)	29.4 ^{A,C} (25)	15.3 ^{A,C} (13)	5.9 ^A (5)	5.9 ^A (5)	16.5 ^A (14)	15.3 ^{A,a} (13)	20.0 ^{A,a} (17)
1	12.9 ^{B,C} (11)	3.5 ^{B,C} (3)	1.2 ^{B,C} (1)	2.4 ^{B,C} (2)	9.4 ^B (8)	5.9 ^B (5)	7.1 ^B (6)	3.5 ^{B,a} (3)	5.9 ^{B,a} (5)

I - Salami (100% beef meat); II - Sausage (20% beef meat and 80% pork meat); III - Chicken Salami (72% broiler breast meat). ** - Absolute number of the samples is shown in parentheses. # - rating level: Taste: 3- satisfactory, 2- average, 1- non satisfactory; Salt content: 3- balanced, 2- not salty enough, 1- too salty; Smoke: 3- balanced, 2- too weak, 1- too strong. Same letters between columns: ^{A,B,C} - p<0.01; ^a - p<0.05; (Chi-square test, www.graphpad.com).

The traditional smoked meat products were evaluated by 55.3-88.2% of interviewed consumers as products with satisfactory taste, balanced salt content and smoke. Results of statistical analyses showed that there is significantly difference ($p < 0.01$) between consumers' frequency answers (satisfactory, average, non-satisfactory). Although same samples were evaluated as samples with too strong smoke, some investigations (Troeger *et al.*, 2009) indicate that traditional smoked meat and meat products with strong smoke contain higher antioxidant constituents (phenols) in comparison with industrial smoked meat products. Those antioxidant constituents protect fat in meat products from oxidative and hydrolytic degradation process and consequently preserve the taste.

Concluding remarks

The obtained results admit the conclusion that traditional smoked meat products from Serbia and Montenegro showed satisfactory sensory evaluations, but at consumers' point of view, they would be enrichment for the (West) European market. High salt content and too strong smoke of the meat products are the main deficiencies. Additionally, beef steak and its' related products are not represented in the German market, but they could be, considering the fact that they were evaluated with the highest DLG awards.

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Senzorna ocena i kvalitet tradicionalno dimljenih proizvoda od mesa iz Srbije i Crne Gore – značaj za potrošače

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Rezime

U ovom radu dat je pregled istraživanja (2005-2015) kvaliteta i senzornih osobina dimljenog mesa i dimljenih proizvoda od mesa iz Srbije i Crne Gore. Takođe su prikazani i najnoviji rezultati istraživanja. Dobijeni podaci u ovoj studiji

su rezultat dugogodišnje i veoma uspešne saradnje između Federalnog centra za nauku o mesu (sada Max-Rubner Institut) iz Kulmbaha (Nemačka) i Instituta za higijenu i tehnologiju mesa iz Beograda (Srbija). Senzorna ocena proizvoda urađena je primenom svetski priznatog testa nemačkog poljoprivrednog društva (DLG test), kao i učešćem na zvaničnim DLG ocenjivanjima u Nemačkoj. Tradicionalno dimljeni proizvodi od mesa iz Srbije i Crne Gore bili su ocenjeni zadovoljavajućim senzornim DLG ocenama. Od 155 analiziranih dimljenih proizvoda, 57% je ocenjeno zlatnom DLG medaljom, 31% srebrnom, a 12% proizvoda je ocenjeno bronzanom DLG medaljom. I pored toga, sa aspekta potrošača sa zapadno evropskog tržišta, neophodno je poboljšati kvalitet tradicionalnih proizvoda iz Srbije i Crne Gore. Visok sadržaj soli i prejak dim su glavni nedostaci. Sa druge strane, na nemačkom tržištu nisu zastupljeni proizvodi poput govedeg ramsteka i njemu sličnih proizvoda, a mogli bi da budu, s obzirom da su ocenjeni najvišim DLG ocenama.

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